

MOTOR AGE

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No. 24

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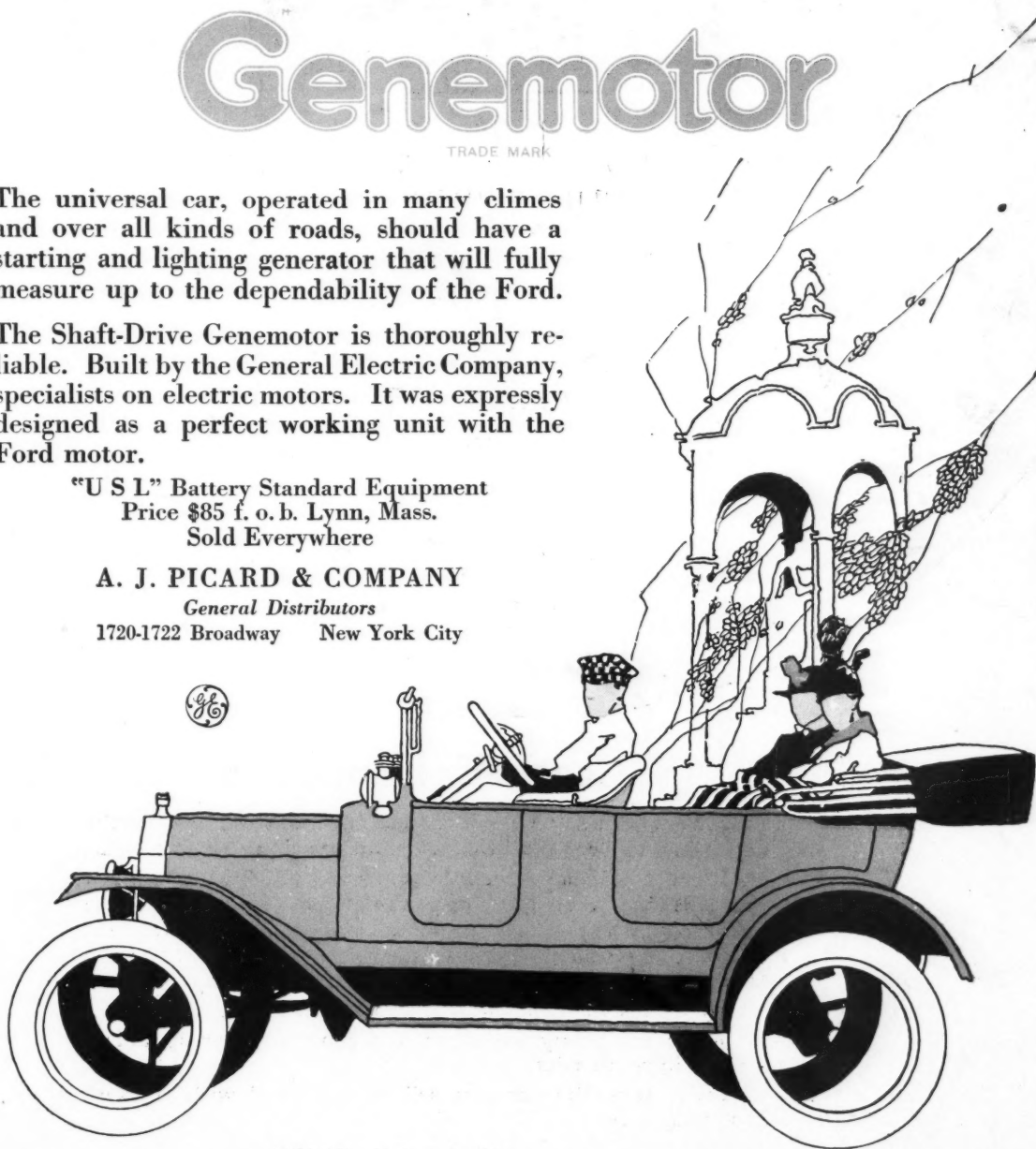
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MOTOR AGE



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REVIEW OF S. A. E. CRUISE NEXT WEEK

Members of the Society of Automobile Engineers are now cruising somewhere on Lake Huron on their annual summer outing, and incidentally are discussing questions which are momentous to the motor car world. A story of their doings will be a thesis on up-to-the-minute motor car development and will be as interesting to the enthusiastic car owner as it will to the practical engineer. The speakers on the tour are among the leaders of the rapidly growing clan of motor car engineers and the subjects of their papers have been carefully selected. The unfortunate members who, for numerous reasons, were obliged to miss this big combination of business and pleasure, will find a digest of the papers to be read in this issue of Motor Age and a detailed account of the big doings in next week's edition. Plenty of pictures will accompany the story.

Second Announcement

In the issue of June 29, Motor Age will begin a series of practical articles on the care of the car, as announced last week.

This series will be presented in such a manner that the man who needs help in obtaining a clear and practical understanding of the many applications of electricity to the modern motor car will be greatly benefited by following each installment as it appears.

In the first part of the series the relation of the varied electrical quantities will be illustrated by numerous actual examples as met by the practical man in his every day work, thus serving to give a clear understanding of the operation of the electrical circuit and at the same time enabling him to appreciate the practical application of these relations.

The larger part of the series is to be given up to the various types of equipment and their operating characteristics, particular attention being paid to the cause of the failure of the different systems and the methods of remedying these causes.

Further Details
Next Week



Opportunities



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MOTOR AGE

Resta Repeats on Chicago Speedway

De Palma Finishes Second After Spectacular Battle

By W. K. Gibbs

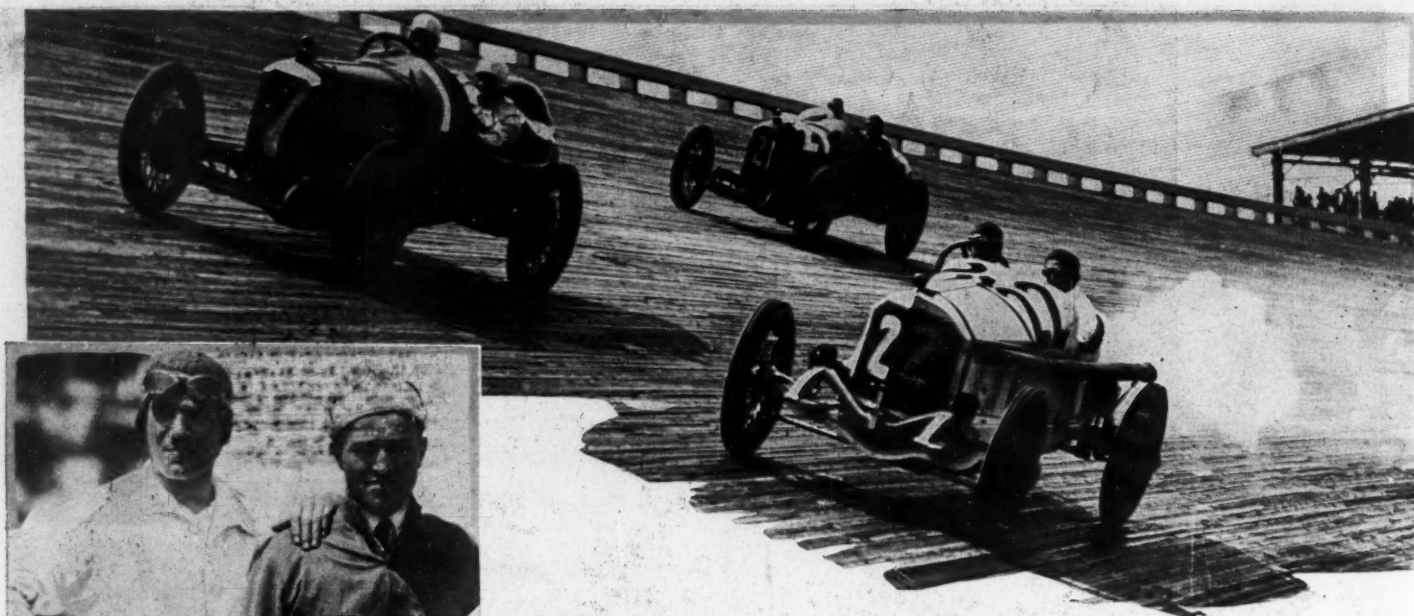
SPEEDWAY Park, Chicago, June 11—Six thousand dollars for 64 seconds! These golden ticks of the clock represented the time necessary to replace one small but significant part on Ralph De Palma's Mercedes and robbed nearly 100,000 spell-bound spectators of what promised to be one of the most spectacular race finishes in the annals of motor car racing history and left Dario Resta to repeat his victory of last year and take down the big end of the \$30,000 purse in Chicago's second annual speedway race unchallenged. These two sons of sunny Italy kept the crowds on the qui vive throughout the race and for the last hour before the finish everyone found sitting down too tame. From thousands of throats came rousing cheers each time the blue Peugeot and the cream-colored Mercedes passed the stands or bleachers, cheers that made these two modern gladiators put on every ounce of power they had in their battle for supremacy, and

it was a royal fight in which neither would give in as long as steel lasted.

A new record for the Chicago track was set by Resta, his time for the 300 miles being 3 hours, 2 minutes, 31.64 seconds, whereas in last year's 500-mile sweepstakes his time for 300 miles was 57

HOW THEY FINISHED AND WHAT THEY GOT

No.	Car	Driver	Time	M.P.H.	Prize
21	Peugeot	Resta	3:02:31.64	98.61	\$13,000
22	Mercedes	DePalma	3:04:25.37	97.60	6,500
29	Sunbeam	Christiaens	3:07:55.48	95.78	3,000
8	Duesenberg	O'Donnell	3:08:30.46	95.48	1,500
16	Sunbeam	Galvin	3:10:23.45	94.54	1,300
24	Hudson	Vail	3:10:30.65	94.48	1,200
18	Duesenberg	D'Alene	3:13:02.85	93.24	1,100
4	Burman Special	Gable	3:15:51.31	91.90	900
14	Hudson	McCarthy	3:19:10.73	90.38	800
26	Crawford Special	Lewis	3:24:58.07	88.63	700



Rickenbacher and de Palma take the south turn at 100-miles-an-hour pace and Resta is a close third



De Palma and Resta, two sons of sunny Italy, stars in Chicago's second annual race

seconds more. Likewise the records for 100 and 200 miles were shattered. Last year Porporato lead at 100 miles, his time being 1 hour and 28 seconds, while the wily Dario pushed his Peugeot over the starting line on the fiftieth lap today in 59 minutes, 34.7 seconds. Resta, today, bettered his time of 2 hours, 2 minutes and 17 seconds for 200 miles last year, by a fraction of a second only.

Twin City Finish Expected

So keen was the rivalry between de Palma and Resta that interest in what the others were doing seemed to be wanting. Many looked for another Twin City finish, when less than one-fourth second separated Cooper's and Anderson's Stutzes,



Position in which each of the cars started

but the jinks that de Palma thought he shook at Indianapolis last year, when he tasted victory for the first time on the Hoosier oval, rode with him and made his presence known when Ralph thought he saw fame and fortune smiling at him 4 miles away. The F. and F. duo proved to have been smiling at Resta, who was just behind the hurdling Mercedes, and Ralph mistook her smiling glances as intended for him.

After the withdrawal of the six Indianapolis speedway entries it was frequently heard about the track this morning that today's race would not be so good as last year's; that it would be tame. Nothing could be farther from the truth. Old timers, who have seen racing since racing began—those who found thrills for their jaded nerves only in wrecks and smashed cars—waved their arms and shouted themselves hoarse; they were boys again.

Resta drove with great confidence, born of four victories over the long-distance route since he invaded America a year and a half ago, but his experience at Indianapolis 2 weeks ago was very tame as compared with the real battle he waged and won today. De Palma asked no quarter and gave none. He forced Resta to give his mount all he had in it and it was a wop battle from 120 miles on to 296 miles.

In the early part of the race Rickenbacher kept Resta on the defensive. When the race was postponed from yesterday to today, it automatically put Ralph Mulford out as his scruples do not permit of driving, or working on his car on Sunday. Knowing that Rick was without a mount through the action of the six Indianapolis entries being withdrawn, he offered Baron Ed his Peugeot, and the switch was sanctioned by Luther Brown, a Harvard student, who entered the car. Rick gave battle to Resta until the sixty-first lap, when a broken valve put him out of the running.

Owing to congestion at the gate the race was held for 45 minutes, Starter Wagner giving the flag to the field at 2:15, after De Palma had paced a lap at 60 miles per hour. The lineup of the cars was as follows:

First Row—De Palma, Mercedes; Rickenbacher, Peugeot; Resta, Peugeot and Christiaens, Sunbeam.

Second Row—Olsen, Olsen Special; Oldfield, Delage; Gable, Burman Special and O'Donnell, Duesenberg.

Third Row—Galvin, Sunbeam; D'Alene, Duesenberg; Buzane, Duesenberg and Lewis, Crawford.

Fourth Row—Rawlings, Duluth Special; McCarthy, Hudson; Henning, Ogren and Haibe, Ostewig.

Fifth Row—Vail, Hudson; Kline, Kline Special; Johnson, Crawford, and Watson, J. J. R. Special.

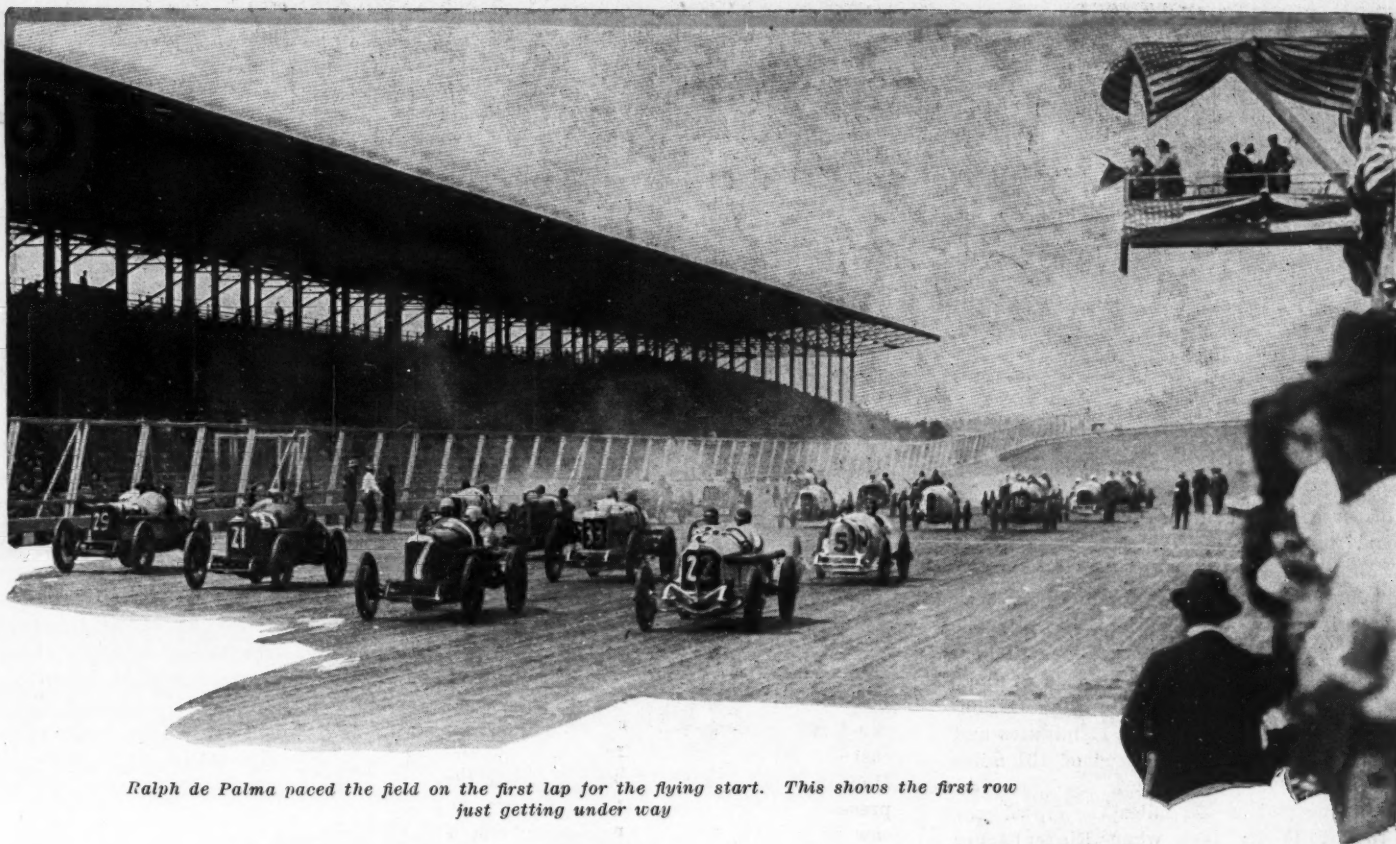
Sixth Row—Alley, Kline Special.

When Wagner gave them the starting flag the first four crossed the line as if they were one car, but this situation did not last long, for Resta forged to the front, seemingly with the idea in mind that the man who hits the first blow wins the battle, which in the end proved true. **Competition Never So Keen**

Never has there been such keen competition on the Chicago track. Resta has drunk from the cup of victory in every professional race ever held on the 2-mile board oval, taking the first 500-mile event, the 100-mile invitation race and today's 300-mile dash. At the end of the first lap he was about three car lengths ahead of Christiaens's Sunbeam, which, by the way, never showed the way to the field, notwithstanding its name. Rickenbacher was neck and



How they stood after 20 miles had been run



Ralph de Palma paced the field on the first lap for the flying start. This shows the first row just getting under way

neck with Christiaens at the end of lap one, but by the end of the second lap Barney Oldfield got a burst of speed from his Delage that put him in second place and the pace was somewhat better than 100 miles per hour. Eddie O'Donnell, the hero of California, by virtue of taking three races in less than a month in the Golden State this spring, jumped to third place in the third lap and changed places with Oldfield at the end of 6 miles, with Resta leading and Barney third. De Palma was in fourth place.

O'Donnell in Lead at 8 Miles

Eight miles saw O'Donnell jump into the lead only to be passed by Resta on the next lap, holding this position for 4

miles, then dropping to fourth and giving second place to D'Alene and third to de Palma. At 16 miles D'Alene was leading Resta and de Palma by a car length, but in the next 4 miles he dropped to fifth place and never got closer than that to first place again. Resta led in the ninth and tenth lap, but was passed by Rickenbacher in the eleventh lap and held in second place for 4 miles with de Palma crowding him close. Then Resta regained first position and held it for 28 miles, with Rickenbacher second, the Olsen Special third and de Palma fourth until the 50-mile mark was reached.

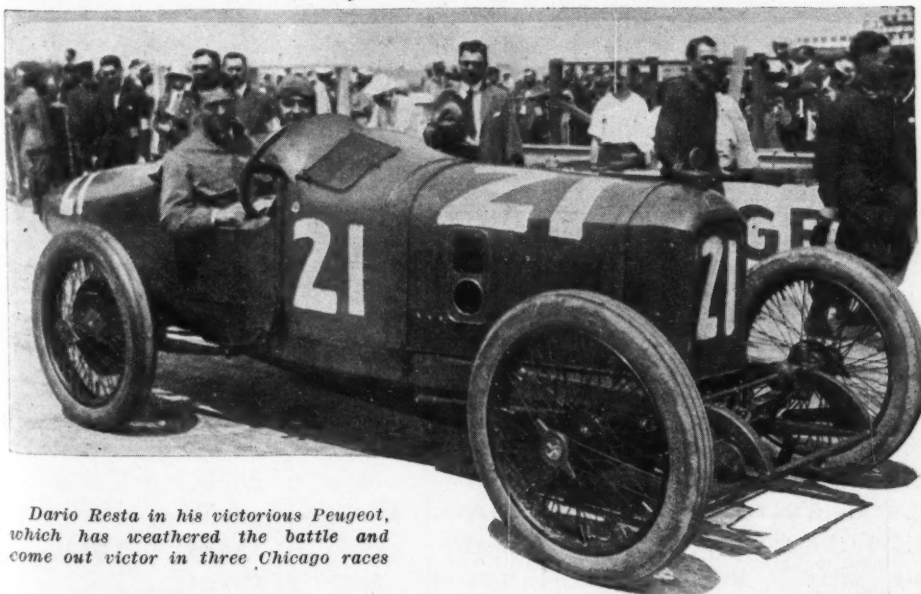
Rickenbacher took the lead for a lap at 50 miles with Resta second and O'Don-

nell third. De Palma gave O'Donnell a hard battle for third place in the meantime. Rick and Resta changed places at 52 miles and Rick again took the lead at 58 miles and held it for two laps. Resta's time for the first 50 miles was 30 minutes and 18 seconds, an average of 99.5 miles per hour. A blanket would have covered Resta, Rickenbacher, O'Donnell and De Palma at 50 miles, however. Resta's speed never faltered during the next 10 miles and he rounded 30 laps, or 60 miles, in 36 minutes and 11 seconds. At this point the order was Resta, Rickenbacher, O'Donnell, de Palma, Christiaens, Galvin, D'Alene, McCarthy and Vail.

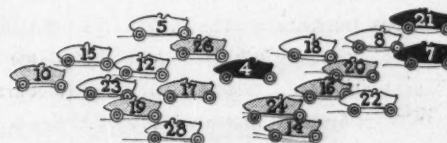
Rick Jumps into Lead

Resta set the pace and a fast one until displaced in the eighty-fourth mile by Rickenbacher, though the latter only held it for 2 miles. De Palma seemed to drop behind but near the 100-mile mark was seen to shorten the gap that separated him from Rick and Resta. Ralph stopped for a left rear tire after finishing 106 miles and was lapped shortly after.

Resta held his lead over Rickenbacher at 100 miles and garnered the \$500 prize for being first at the century mark. Rickenbacher, de Palma, D'Alene, Christiaens, and Galvin following in the order named. Resta's time for the first century was 59 minutes and 34 seconds, an average of



Dario Resta in his victorious Peugeot, which has weathered the battle and come out victor in three Chicago races



Positions at the end of 60 miles



Line-up of officials, drivers, mechanics, pitmen and cars just before the start

101 miles per hour, a pace he had kept consistently.

Baron Rick wrested the lead from Resta at 104 miles and held it for five laps, then gave it up for one and took it again for two. The order at 120 miles was Rickenbacher, Resta, Christiaens, de Palma, D'Alene, Buzane, Vail, Gable and O'Donnell. The time was 1 hour 11 minutes and 30 seconds, an average speed of 101 miles per hour.

At the end of 122 miles the crowd was brought to its feet when Rickenbacher and Resta pulled into the pits at the same time. Eagerly spectators watched to see who would get away first, but Rickenbacher found his trouble in a broken valve which forced him out of the race. When Rick went out eighteen cars were still in the race, Alley's Kline having been disqualified for excessive smoking and Oldfield having broken the crankshaft of his Delage in the eighteenth mile.

Rick Out with Broken Valve

Resta's stop helped de Palma to make up some of his lost distance and Ralph headed Resta at 132 miles, while from then on it was a continual see-saw for first and second position between the two

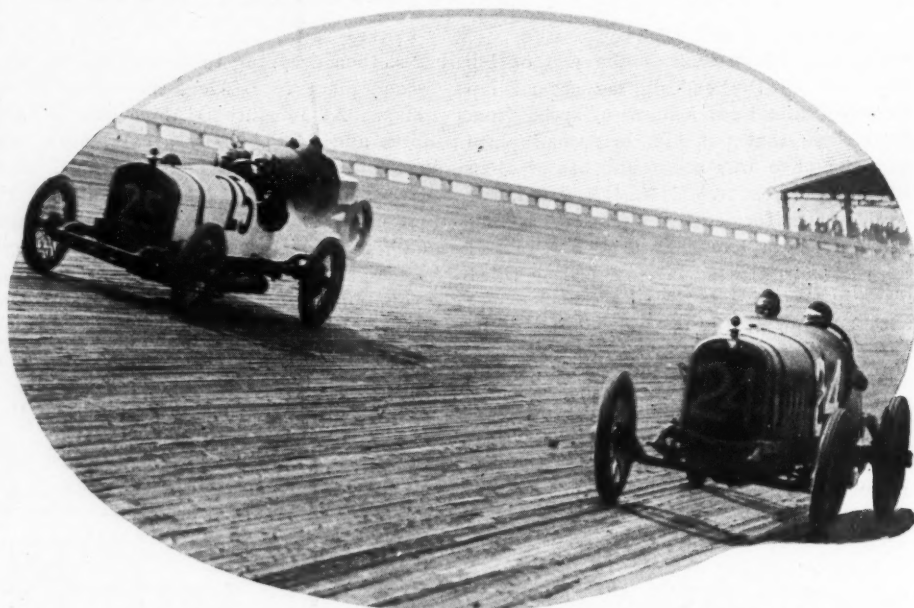
Italians. At 138 miles Resta led and at 140 de Palma.

Each side of the 2-mile oval had its brushes. Resta headed de Palma in the

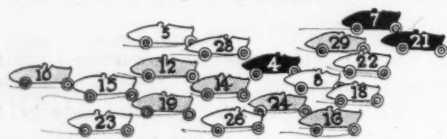


The lineup at 100 miles, with Resta in the lead and Rickenbacher and de Palma close

turn going out of the homestretch and the cheers for Dario, as he set the pace down the backstretch could be heard above the roar of exhausts, while de Palma invariably, lap after lap, would pass Resta on the turn going out of the backstretch and be the recipient of equal cheering as he acted as pacemaker in front of the



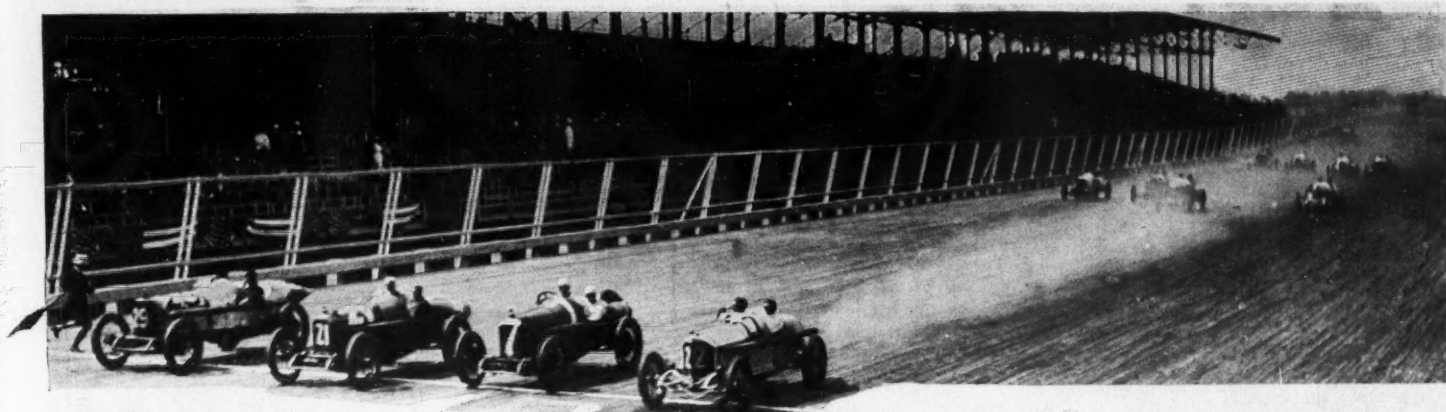
Kline leads Vail and Gable into the first turn out of the homestretch



At 140 miles, when the fight between Resta and Ralph began to get interesting

Times for the Finishers at Intervals of Ten Laps

No.	Car	Driver	20	40	60	80	100	120	140
1	21—Peugeot	Resta	12:09	24:05	36:11	47:52	59:34	1:11:15	1:25:54
2	22—Mercedes	DePalma	12:11	24:21	36:24	48:35	1:00:43	1:13:59	1:25:55
3	29—Sunbeam	Christiaens	12:25	24:48	37:19	49:44	1:02:04	1:14:23	1:26:36
4	8—Duesenberg	O'Donnell	12:11	24:17	36:20	50:19	1:02:38	1:14:52	1:28:37
5	16—Sunbeam	Galvin	12:40	25:06	37:25	49:45	1:02:05	1:14:24	1:26:41
6	24—Hudson	Vail	12:48	25:36	38:23	51:01	1:03:25	1:15:08	1:29:51
7	18—Duesenberg	D'Alene	13:26	25:34	37:42	49:53	1:01:54	1:16:23	1:32:01
8	4—Burman Special	Gable	12:48	25:38	37:47	51:32	1:03:59	1:16:21	1:28:36
9	14—Hudson	McCarthy	12:51	25:39	38:21	53:01	1:07:40	1:21:37	1:34:42
10	26—Crawford Special	Lewis	14:00	26:35	41:34	54:02	1:06:32	1:20:08	1:32:25
11	7—Peugeot	Rickenbacher	12:11	24:06	36:11	47:53	59:35	1:11:14



When Fred Wagner gave the flag to the field the first four crossed the line as one car and soon left some of the others far behind

stands on the homestretch. It was a battle royal, both Resta and de Palma using all their ring generalship for position on the turns. Early in the race Ralph drove the turns high, but after Rickenbacher dropped out he began hugging the inner side of the track and in the spurts showed he had plenty of speed to keep the fastest of them hustling.

At 140 miles de Palma led with Resta next and Christiaens, Galvin, O'Donnell, Gable, D'Alene, Vail, Watson and Lewis

next in the order named. Ralph's time at 140 miles was 1 hour, 26 minutes and 30 seconds, an average speed of 101 miles per hour. At 160 miles Resta led, de Palma was second and Christiaens, third. In the eighty-second lap de Palma again took the



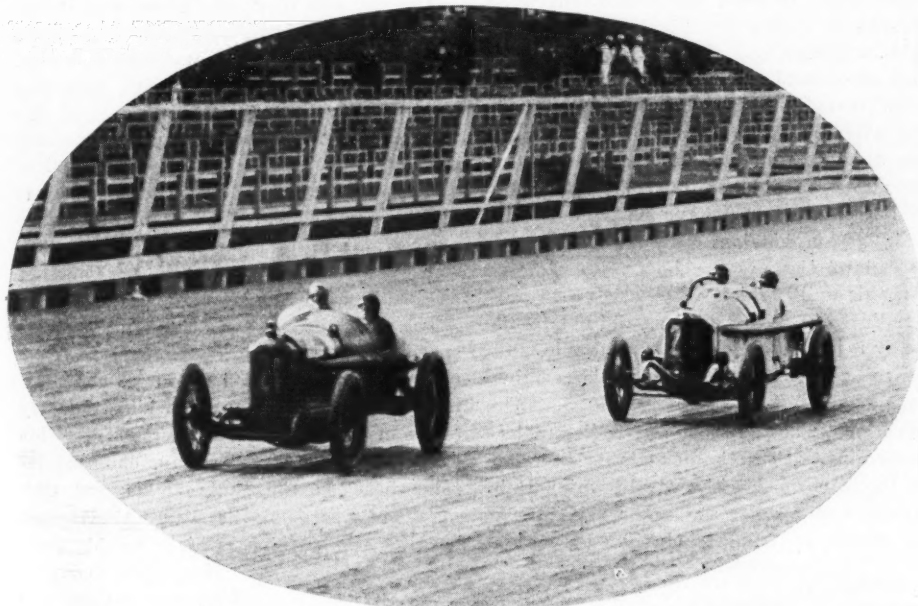
How the field looked at 180 miles. The four first to finish were in their same positions at that time.

lead, being about 50 feet ahead of Resta, and maintained the gap for 8 miles. At 172 miles Resta passed de Palma in front of the stands, holding the lead up to 184 miles when de Palma emulated the example set by Resta, but held position for only one lap. The order at 180 miles was: Resta, de Palma, Christiaens, O'Donnell, Gable, Vail, Galvin, D'Alene, Lewis and McCarthy. Resta's time at this point was 1 hour, 50 minutes and 10 seconds.

Resta Leads at 200 Miles

In the ninety-eighth lap Resta took the lead and held it to 216 miles, taking another \$500 for being first at the end of the second century. His time for the 200 miles was 2 hours, 2 minutes and 16 seconds. At 216 miles De Palma gave the Mercedes a thrilling pace and gradually opened up a gap of 150 yards between himself and Resta. Dario seemed confident, however, and was pushing the Peugeot for all it was worth, although he was forced to keep in second place most of the time for the next 60 miles.

Excitement was rife. The crowd found sitting monotonous and it looked like a seventh-inning stretch as not a person could be seen on either side of the big track that was not on his or her feet.



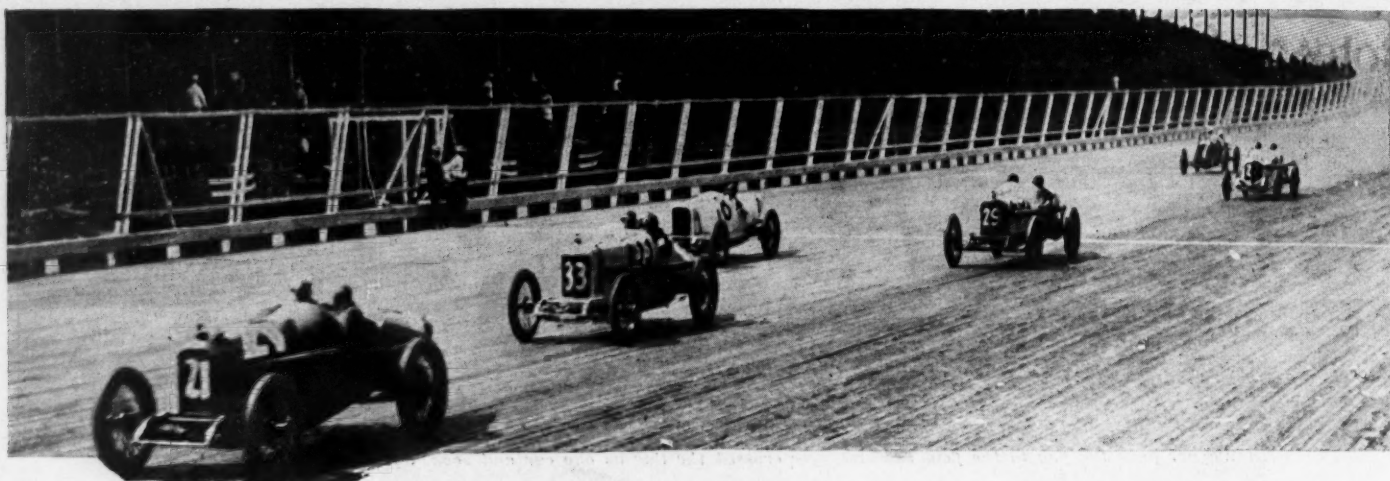
Resta and de Palma in battle for first place in front of the stands



At 220 miles the positions had changed little from those at 180 miles

in the 300-Mile Derby at Chicago, June 11, 1916

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The first four to finish and two early contenders, bunched in front of the stands early in the race. Resta is in the lead, Oldfield second, O'Donnell third, Christiaens fourth, de Palma fifth, and Rickenbacher sixth



How they stood at 260 miles

Near the 250-mile mark de Palma let the Mercedes out and thundered across the tape with enough margin to take down the \$500 prize for the first to finish 250 miles. For 10 miles de Palma continued to open the gap separating him from his rival, then he slowed a bit and Resta picked up. Ralph's time at 260 miles was 2 hours, 37 minutes and 28 seconds, an average of 99 miles per hour.

The Jinx Strikes

At 284 miles Resta stepped on the throttle and forged to the front and a battle royal proceeded for the next 8 miles, when de Palma headed Resta and continued to lead for 4 miles. Then the jinx got in its work and he was seen to slow up in the backstretch, while Resta threw on all the power he could get out of his prize-winning Peugeot and while the cloud of Fate changed frenzied expressions to sorrow, De Palma limped into the pits on three. He was obliged to stop only a few seconds and put in a new plug, but the stop cost him whatever chance he had at first place, and judging from the cheers that greeted him as he got the checkered flag and won \$6,000 for finishing second, there were many thousands who believed he could have pulled down first prize of \$12,000 had not the ignition gone wrong.

Christiaens, who drove very consistently throughout the race, flashed

across the finish line $3\frac{1}{2}$ minutes behind de Palma. According to early reports, Vail finished fourth in his Hudson, but after checking the times fourth money was given to O'Donnell, his time being but 35 seconds more than Christiaens, and Vail was shoved down to sixth place. With Resta and de Palma both finished, the reaction that comes after a thrill began and spectators began to leave the stands, but were brought to a stop by the clanging of ambulance gongs and the waving of yellow flags all around the course. Galvin's Sunbeam was in distress on the south turn just after getting the green flag and it was thought until after rechecking the times that he did not finish, but it developed that he should have had the checkered flag on his last time over the tape instead of the green. Fortunately, however, his spill, which was not due to mechanical difficulties or tires, did not result in any injuries to himself or mechanic, and the record of the Chicago track remains unmarred.

D'Alene, who ran second at Indianapolis, finished seventh and Jack Gable brought the Burman special, the car in which Bob Burman lost his life at Corona this spring and which is being campaigned for his

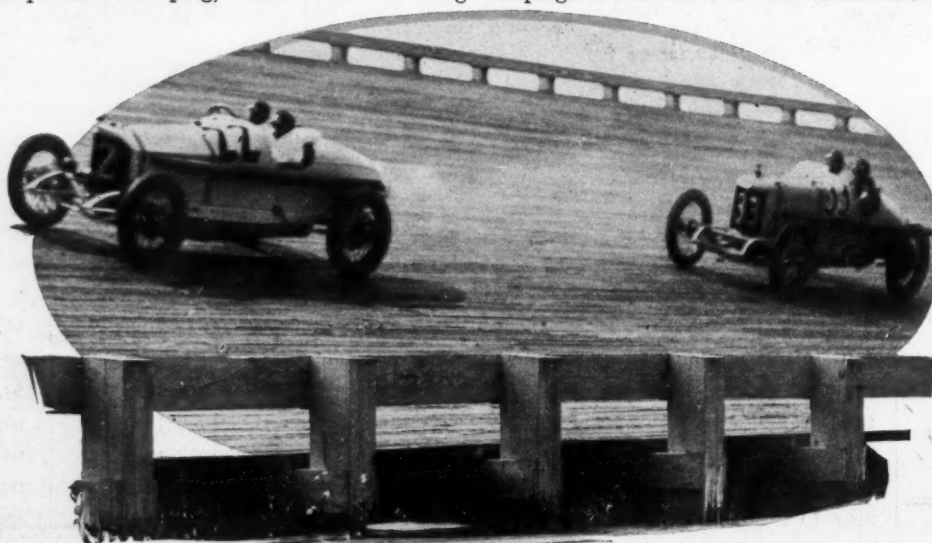


Positions in which they finished

widow, into eighth place. McCarthy, piloting the other Hudson Super-six, finished ninth, and Lewis brought his Crawford to the line in tenth place, just inside the prize money.

The day was ideal, the crowd was everything that the promoters could have hoped and everyone got their money's worth. The infield was well filled with cars, two or three deep for a good share of the way around the course. Notwithstanding the 5 days of rain, the infield and the driveway around the inside of the course was in ideal condition, which proved that the work of draining the speedway area was well engineered, and that rain will not act as any great deterrent upon parking cars.

The withdrawal of the Indianapolis speedway entries put out five stars, each of whom was looked upon to be contenders and some one of which possibly to be a winner. Gil Anderson sent his Premier, which, by the way, changed its color between the Indianapolis and Chicago meets, around the course the fastest in the eliminations, which would have given him the pole were it not for the eleventh hour withdrawal of his car by the powers that be. He saw the race from the pits. Aitken qualified well over 107 miles per hour, but also was a spectator by necessity and not by choice. Wilcox and Merz as well as Henderson were figured to keep well up toward the front had they been allowed to start, but Fate decreed otherwise.



De Palma and Oldfield on the turn, fighting for place during first 10 miles

Notes of Chicago's Second Annual Sweepstakes Race



Daria Resta being handed first prize check of \$13,000 by Referee Clifford Ireland. Behind him is D. F. Reid, president of the Chicago Speedway, and on the right, Ralph de Palma, Resta's rival for first honors in the most thrilling race ever seen on the Chicago board oval

The taste of American dollars is good to Christiaens, and the rumor that was afloat Sunday to the effect that he was to return to Belgium is without foundation.

* * *

Not many in the stands knew that the white-clad pitmen for de Palma were millionaires. The three Book brothers, of Detroit, each of whom counts his wealth in seven figures, acted as swipes for the Mercedes.

* * *

The Premier, while not in the race, were in evidence in practice. One noticeable thing about them was their change in clothes. At their debut in Indianapolis they wore green, but now fare forth in gray.

* * *

Barney Oldfield has driven his last race, so he says. He has wrapped the Delage up carefully and will return to Los Angeles this week. The day before the race he sold his Christie, the venerable antique which he picked up for \$700. Incidentally he got

\$3,000 for it. Friedman brothers, of New York, will put the old relic under canvas and charge 10 cents a look for everyone who wants to give Barney's world-famous mount the O-O.

* * *

O'Donnell, who secured a temporary release from the Duesenberg team to drive C. T. Devlin's entry, Eddie's mount not being ready, will not forsake his old berth. He is back in the Duesenberg camp and preparing a new car for Des Moines.

* * *

Cliff Ireland did some fancy terpsichorian steps while dodging some of the cars which came into the pits rather hastily and close together. He was seconded by Wagner, who found himself between two flyers—not fires—when flagging a car hugging the inside rail at the finish.

* * *

"I know why Resta won," declared a woman who is known to have seen every race so far at Speedway Park. "Every time he

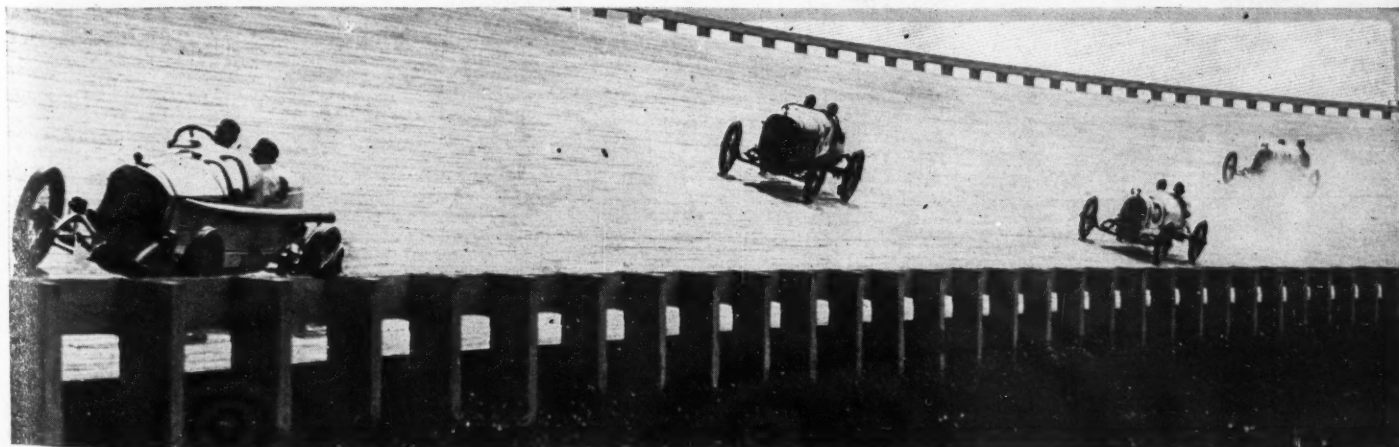
passed de Palma his car shot out smoke and de Palma would get lost." "There's an old phrase about 'a poor excuse,'" commented her male companion as he handed her a V and murmured that his bet was paid.

* * *

Four six-cylinder cars, two Sunbeams and two Hudsons were entered and all finished in the money. The showing of the Hudsons was surprising to many, while the Sunbeams were tried and their qualities known. The Hudsons were looked upon as out of their sphere in fast company, but showed their mettle to good advantage.

* * *

A man who was reticent about giving his name edged his way bashfully up to one of the announcers after the first four or five had finished and asked: "Who was it that drove No. 22?" No amount of questioning could induce him to tell where he had been. Someone suggested that he must have been down under the grandstand reading a book. He was sober, too.



De Palma, Vail, Olsen and Watson in the north turn during the early part of the race

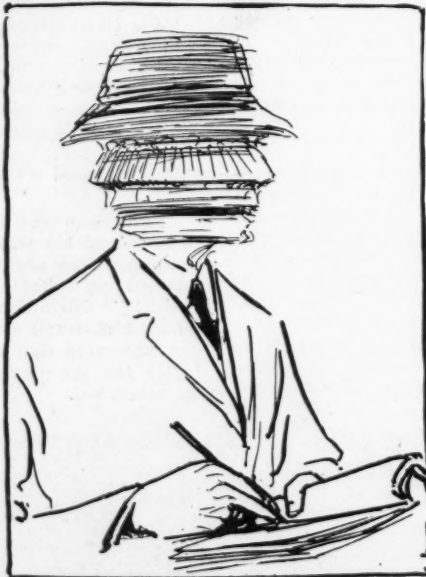
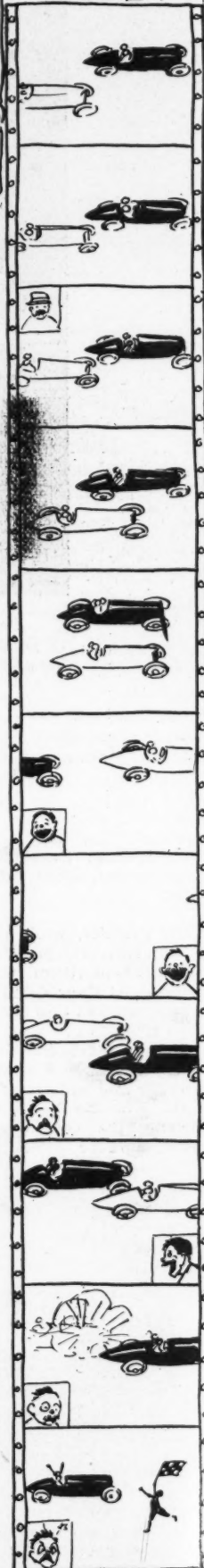
Incidents Seen and Conversation Heard by Cartoonist Wilder During Race

OUR OWN MOVIES
REEL ISHALL I START
THE FOG SIGNAL
CAP?HOPE WE'RE ON
THE TRACK WHEN
WE RUN OUT OF THIS

CAR 25 RULED OFF FOR SMOKING

RICKENBACHER
WORRIED EVERYONE
DRIVING SO HIGH
ON THE TURNSHEY! COME
ON DOWN YOU
AINT GOT NO
FLYIN'
MACHINE

T.M.W.

THE MAN WHO HAD
NEVER SEEN A
SPEEDWAY RACE
BEFORE—TRYING
TO KEEP SCOREHOW DO YOU
SQUARE A
CIRCLE ANYHOW?BIRD'S EYE VIEW OF
MAN TRYING TO FIGURE
HOW MUCH FURTHER
RICK. WENT BY
DRIVING SO HIGHMY LAST
RACE!!
I'M THRU!!OUR OWN MOVIES
REEL II

"Look This Way Just a Moment Please"



Resta had a serious look when he finished that showed how de Palma's speed had worried him



Resta is awarded the cup



Above—Ralph de Palma's losing smile. Note the effect of flying grease on his face



Gil Anderson watching to see if his record, made at Sheephead Bay last year, is broken



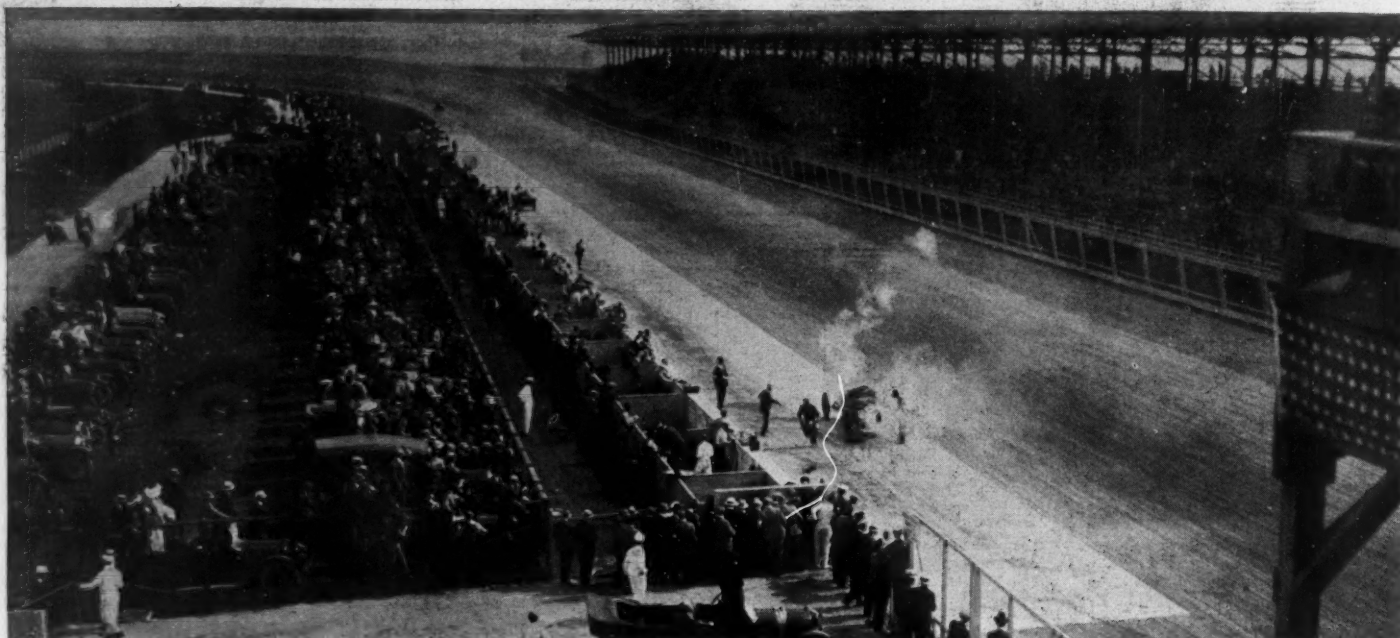
Fred Wagner, starter; Clifford Ireland, referee, and Tom Hay, assistant referee, in their working clothes



Right—Josef Christiaens at the end of his consistent 300-mile drive

Tires and Equipment—Not Motors—Fail at Crucial Moments

Broken Spark Plugs and Over-Lubrication Contribute to Shattered Hopes



View across the pits from judges' stand during Resta's only stop. The steaming Peugeot is seen in the foreground. Farther down the pits is Rickenbacher, out on the same lap with a broken valve

Why They Stopped at Pits

Reasons	Stops
Tires: Right rear	17
Left rear	8
Right front	4
Spark plug changes.....	6
Replenishing gasoline supply.....	14
Replenishing oil supply.....	8
Mechanical adjustments	14

Total operations

Total of pit stops.....68

Why They Stopped Altogether

Reasons	Number
Broken connecting rod.....	3
Broken transmission	1
Valve trouble	2
Excessive smoking	1

CHICAGO, June 11—With twenty-one cars in the race stopping at the pits a total of sixty-eight times, or an average of nearly three and one-half stops per car, the record-breaking race taught many lessons from a standpoint of mechanical efficiency in the cars. A summary of the troubles, however, would lay the blame of the pit stops at the door of the equipment on the cars rather than in the motors or chassis.

In the race of a year ago the cars went the 500 miles with but very few more pit stops than did the cars this year in three-fifths of the distance. The time of the winner is but a few tenths of a mile an hour faster than it was last year and the cars under him did not average as fast. Stops for troubles of a mechanical nature,

By Wallace B. Blood

olis did not appear in this, the third big race of the year.

however, were proportionately fewer than last year and far under the record set at Indianapolis on May 30. This is possibly track as far as tire consumption goes, due to the fact that eight of the new and than it was this year. The boards have untried cars which competed at Indianapolis become weathered and roughened. Cars

Drivers, Cars, Motor Sizes and Equipment of Participants

No.	Car	Driver	Bore and Stroke	Cyl.	Disp.	Carb.	Mag.	Plugs	No.	Pistons	Oil
21	Peugeot.....	Resta.....	3.70 x 6.65	4	224.3	Miller....	Bosch..	K.L.G.	8	Magnalium.	Oilzum....
22	Mercedes.....	DePalma....	3.70 x 6.49	4	178.0	Mercedes.	Bosch..	Rajah..	8	Magnalyte..	Monogram..
29	Sunbeam.....	Christiens..	3.21 x 6.14	6	299.8	Miller....	Bosch..	K.L.G.	6	Magnalium.	Castorol...
8	Duesenberg....	O'Donnell...	3.75 x 6.75	4	298.2	Miller....	Bosch..	Rajah..	8	Magnalium.	Oilzum....
16	Sunbeam.....	Galvin.....	3.21 x 6.14	6	299.8	Miller....	Bosch..	Rajah..	6	Magnalium.	Castorol...
24	Hudson.....	Vail.....	3.50 x 5.00	6	288.6	Hudson...	Delco..	Rajah..	6	C. I.....	Veedol....
18	Duesenberg....	D'Alene....	3.75 x 6.75	4	298.2	Miller....	Bosch..	Rajah..	8	Magnalium.	Oilzum....
4	Burman.....	Gable.....	3.63 x 7.93	4	279.8	Miller....	Bosch..	K.L.G.	4	Alloynaem..	Castorol...
14	Hudson.....	McCarthy...	3.75 x 6.75	6	288.7	Hudson...	Delco..	Rajah..	6	C. I.....	Castorol...
26	Crawford.....	Lewis.....	3.75 x 6.75	4	298.0	Miller....	Bosch..	Rajah..	8	Magnalium.	Oilzum....
15	Duesenberg....	Busane.....	3.98 x 6.00	4	300.0	Miller....	Bosch..	Rajah..	8	Magnalium.	Oilzum....
7	Peugeot.....	Rickenbacher.	3.74 x 6.65	4	292.6	Miller....	Bosch..	Rajah..	4	Magnalium.	Castorol...
33	Delage.....	Oldfield....	3.74 x 6.29	4	275.0	Miller....	Bosch..	Rajah..	4	Alloynaem..	Oilzum....
23	Kline Spec....	Alley.....	3.98 x 6.00	4	300.0	Miller....	Bosch..	Rajah..	8	Magnalium.	Monogram..
25	Kline Spec....	Kline.....	3.98 x 6.00	4	300.0	Miller....	Bosch..	Rajah..	8	Magnalium.	Monogram..
28	Ogren.....	Henning....	3.98 x 6.00	4	300.0	Miller....	Bosch..	Rajah..	8	Magnalium.	Castorol...
12	Crawford.....	Johnson....	3.75 x 6.75	4	298.2	Miller....	Bosch..	Rajah..	8	Magnalium.	Castorol...
10	Ostewig.....	Haibe.....	4.34 x 5.00	4	296.0	Miller....	Bosch..	Answer.	8	Magnalium.	Oilzum....
5	Olsen Spec....	Thompson...	3.50 x 5.00	4	192.4	Miller....	Bosch..	Rajah..	8	Magnalium.	Sexton....
19	J. J. R.....	Watson.....	3.75 x 6.75	4	298.2	H. & N...	Bosch..	Rajah..	8	Magnalium.	Oilzum....
17	West Duluth...	Rawlings...	3.75 x 6.75	4	298.2	Miller....	Bosch..	Rajah..	8	Magnalium.	Castor-Sexton...



After skidding 200 feet beyond his pit D'Alene, winner of seventh place, backs in his Duesenberg for a new tire

of slower speed than competed last year had more tire trouble and the weather conditions were very near the same, the beating sunlight of the afternoon, however, serving to warm up the boards to a rubber-deteriorating temperature.

The lesson of spark plug trouble brought forth in last year's race did not seem to stir the manufacturers to any measure of activity in the line of perfecting a plug that will withstand such a trying strain. However, it is true that the American-made porcelain-core plugs, used almost exclusively in the cars this year, stood up about as well as the imported plugs of a year ago.

Crankshafts, which used to let loose and

punch holes through the crankcase, in the racing days of Jenatzy and Fournier, are still up to their old tricks, shattering the hopes of three drivers and the motors of the same number of cars, in today's event. Records show that there are practically no makes of cars which have not some time or other gone out with this trouble.

If such is the case, it would appear that the lightening of reciprocating parts is being carried to an excessive amount, and to the detriment of safety in racing motor design. The drop-forged crankshafts, drilled like a sieve, seem to bend first before they let go, which would lead one to believe that the trouble is in insufficient strength rather than in any deteriora-

tion of the metal from the constant pounding it receives.

Twenty-nine tires were changed, seventeen of which were right rears, eight left rears and four right fronts. Every left front tire went through the mill unscathed. Gasoline was taken on a total of fourteen times, no cars going the entire distance without absorbing a supply. Cracked or sooted plugs caused six stops, including the one which called De Palma into the pits on his two hundredth and ninety-sixth mile. Oil tanks were filled eight times and fourteen stops were made for motor adjustments.

Not only the younger drivers, but several of the veterans lost many precious minutes in inept maneuvering at the pits. In five different instances drivers swung in from the home stretch turn, applied their brakes too late, skidded dangerously past the pits and were obliged to make another circuit before coming to a stop. On as many different occasions the cars were driven into the pits too fast and skidded by their own stations, being obliged to back in.

D'Alene Misses Pit

In one instance particularly, D'Alene brought his Duesenberg to a stop, after sliding through pools of oil, about 200 feet from his stall and lost valuable time reversing down the concrete runway to the place his helpers were waiting for him. Nearly two minutes were lost in this instance and it undoubtedly cost the winner of second place at Indianapolis, the sixth position, which went to Vail in the Hudson.

Henning's Ogren was the prize tire eater. He had not gone 20 miles when he swung into his stall with a right rear tire torn to shreds. Another seven laps and he was in for a left rear. Two more right rears and a port-side front were put on before he finished the race. One of Henning's tires divorced its wheel high up on the turn just before the stubby car

in Second Annual Motor Derby in Chicago, June 11, 1916

Wheels	Make	TIRES Front	Rear	W. B.	Shock Abs.	Other Equipment	Driver	Car	No.
R. W. . . .	Silvertown..	34 x 4½	35 x 5	106	Hartford	Motometer . . .	Resta	Peugeot	21
R. W. . . .	Silvertown..	32 x 4½	33 x 5	112	Mercedes	Motometer . . .	DePalma	Mercedes	22
R. W. . . .	Silvertown..	35 x 5	35 x 5	106	Hartford	Motometer . . .	Christiaens	Sunbeam	29
R. W. . . .	Silvertown..	32 x 4½	33 x 5	106	Hartford	Motometer . . .	O'Donnell	Duesenberg	8
R. W. . . .	Silvertown..	35 x 5	35 x 5	106	Hartford	Motometer . . .	Galvin	Sunbeam	16
R. W. . . .	Silvertown..	34 x 4½	35 x 5	105	Hartford	Motometer . . .	Vail	Hudson	24
R. W. . . .	Silvertown..	33 x 4½	33 x 4½	106	Hartford	D'Alene	Duesenberg	18
R. W. . . .	Silvertown..	33 x 4½	34 x 4½	104	Hartford	Motometer . . .	Gable	Burman	4
R. W. . . .	Silvertown..	33 x 4½	33 x 4½	102	Hartford	Motometer . . .	McCarthy	Hudson	14
R. W. . . .	Nassau	32 x 4	34 x 4½	106	Hartford	Motometer . . .	Lewis	Crawford	26
R. W. . . .	Silvertown..	32 x 4½	33 x 5	106	Hartford	Motometer . . .	Buzane	Duesenberg	15
R. W. . . .	Silvertown..	34 x 4½	35 x 5	106	Hartford	Motometer . . .	Rickenbacher . . .	Peugeot	7
R. W. . . .	Firestone . .	34 x 4½	35 x 5	104	Hartford	Motometer . . .	Oldfield	Delage	33
R. W. . . .	Silvertown..	32 x 4½	33 x 5	102	Hartford	Motometer . . .	Alley	Kline Spec	23
R. W. . . .	Silvertown..	33 x 4½	33 x 4½	106	Hartford	Motometer . . .	Kline	Kline Spec	25
Houk	Nassau	33 x 4½	34 x 5	106	Hartford	Motometer . . .	Henning	Ogren	28
R. W. . . .	Nassau	32 x 4½	32 x 4½	106	Hartford	Motometer . . .	Johnson	Crawford	12
Houk	Silvertown..	32 x 4½	33 x 5	102	Hartford	Motometer . . .	Haibe	Ostewis	10
R. W. . . .	Silvertown..	32 x 4	33 x 4½	108	Hartford	Motometer . . .	Thompson	Olson Spec	5
R. W. . . .	Silvertown..	33 x 4½	33 x 4½	101	Hartford	Motometer . . .	Watson	J. J. R.	19
R. W. . . .	Silvertown..	33 x 4½	33 x 4½	106	Hartford	Rawlings	West Duluth . . .	17

swung into the home stretch. It curved gracefully down the track, climbed the retaining wall and plunged into the infield crowd, slightly injuring a woman. On the sixth of his eight stops Henning's mechanic, in an eager attempt to tighten the packing gland in the Ogren's water pump, wrenched the bracket loose from the side of the crankcase. The loose member was pulled in place with tire tape which soon burned off and another stop of 9 minutes was made, when the pump was wired in place.

Resta's Only Stop

Resta's only stop was a masterpiece of pit work. In two minutes the right rear tire had been changed, the radiator filled by the winner himself, and the oil and gasoline supplies renewed. De Palma's pitmen were equally efficient, changing a left rear tire and filling the oil tank in 59 seconds. In his memorable stop which terminated his great sprint with Resta and possibly lost him the race, a spark plug was changed in the remarkably short time of 1 minute and 4 seconds.

Eddie Rickenbacher, who drove the Peugeot which Ralph Mulford refused to pilot on the Sabbath day, set a terrific pace for Resta in the early part of the race and stopped with him at the pits on Resta's only stop. The crowd rose to its feet to see which of the leaders got away first, but what they really did see was a still-smiling Rickenbacher pushing his car to the "dead line." He was out with a broken valve.

The Duesenberg-powered Ostewig, which Haebé drove consistently into the money at Indianapolis, called on the pitmen seven times and finally went out with a locked valve stem which refused to stay lubricated more than twenty miles at a time. Six stops were made to oil the troublesome gas introducer and such routine woes sent Haebé's chances glimmering.

The performance of the two Hudson creations was noteworthy, inasmuch as they both landed a berth in the money with



Despite his five stops, Eddie O'Donnell piloted his Duesenberg into fourth place. This is a view of his first stop, when a right front tire was changed

battery ignition. Vail drove the same reconstructed stock car which gained him third position in the Sheepshead Bay race. His getaway from the pits was unrivalled, inasmuch as his motor was starter-equipped. The feature was of little real value, however, for he was obliged to stop but once and that for a left rear tire change. The other battery igniter, McCarthy's Super-Six special, supposed to have been constructed under the guidance of Ralph Mulford, stopped three times for tires.

The official eyes were widened at the smoking proclivities of a majority of the cars in the race and frequent consultations were had as to the advisability of removing the greatest offenders from the course. Tom Alley, driving a Kline Special, was flagged and ruled out when the race was yet young, for this offense. Many other drivers were warned. The cloud exuders got in their best work in leaving the pits, fogging the air at times so

that the drivers on the track were obliged to rush through an opaque mist, which brought about some rather close calls at the beginning of the first turn. It is undoubtedly a fact that many of the stops for plug changes were due to this excessive use of oil sooting the gas lighters, although in a number of cases the porcelain cores were cracked in pieces. The extremely fast pace evidently had the drivers on edge with worries over burned out bearings and the result was that the mechanics pushed the pumps with reckless abandon.

Gable, in the same car in which the late Bob Burman met his fate and which still resembles a Peugeot, although, by degrees, it has been altered until there are practically no foreign-made parts left, drove the Burman Special into eighth place despite the fact that he was obliged to dock his car five times. Two right rear tires went to pieces, gas and oil were taken on twice, and a loose nut on the rear wheel added another 34 seconds to his final total.

Barney Oldfield Out Early

Barney Oldfield and his chewed Havana were out early in the race. For some time he was in doubt as to the exact nature of the trouble, but finally traced it back to the transmission drive members. Until his compulsory withdrawal he was well up with the leaders and the blue Delage looked like a bidder for the highest honors.

The previously unheard of Olsen Special, driven by Olsen himself was handled rather amateurishly, both in regards to pit work and to the handling of the car. In his six stops, 9 minutes and 22 seconds were consumed, during which there was much consultation and incidentally the tightening of a hood strap, carbureter adjustment, refilling of tanks, one tire change and eventually a change of drivers, when McBride took the wheel. Watson, in his J. J. R. was another rather new performer. His mount stood beside him well for,



In the scant time of 2 minutes Resta and his helpers changed a tire and filled the radiator and gasoline tank. The winner himself is to be seen removing the radiator cap

about half the race, when he went out with a broken connecting rod.

Eddie O'Donnell displayed his mastery in pulling the sixteen-valve Duesenberg through into fourth place, the first American-built car to finish, in spite of the fact that he had to make five stops. Four tires failed and one stop was made for oil and motor adjustment.

Buzane, in the Duesenberg which gained second place for D'Alene, at Indianapolis on May 30, stopped three times for spark plug difficulties. A sidelight on the plug changes of this car may be noted in his stops for water. These also numbered three and from two factors, plugs and water, it can be inferred that overheating was the main cause of the stops made by him. The water supply trouble was due to the fact that the packing gland at the water pump connection was leaking, a disease which seemed to characterize the Duesenberg motors in the race of excessively high speed. There is undoubtedly room for improvement in the method with which these pumps are mounted and the packing nuts fitted.

The two Crawfords, driven by Johnston and Lewis, were frequent stoppers, both being credited with five stops, the former being in for a total of 7 minutes and 48 seconds, and the latter for 6 minutes and 15 seconds. Most of the stops were for tire changes, and let it be said in favor of the designer of the cars and general of the pits, Billie Chandler, that the over-worked pit crew handled each stop without a hitch. Tires were changed on the Crawfords in such excellent times as 25 seconds, and 22 seconds, and on one of Johnson's calls his gasoline tank was filled and he got away in 32 seconds, the gas spilling being done by Chandler himself.

The Sunbeams, humming sixes from England, seemed to be trouble-proof, possibly because of the fact that neither of the drivers pressed them, or made any noticeable bursts of speed. Gasoline and one tire on each were the only things needed. Christaens slid past his station on both stops.



Vail's Hudson on its only stop. The left rear tire was changed in 36 seconds

How They Stand Today

Points Awarded by A. A. A. Following Chicago 300- Mile Race

Resta Has Big Lead in Championship Standing So Far

CHICAGO, June 12—By winning the 300-mile race yesterday and the Indianapolis event on Memorial Day, Dario Resta assumes the lead in the battle of the speed merchants for the title of champion driver of the year and for the \$13,500 purse hung up by the Goodrich and Bosch companies.

The Indianapolis event was the second of the championship series as designated by the American Automobile Association: It was regarded as a more important race than the Metropolitan cup at Sheephead Bay, consequently more points were award-

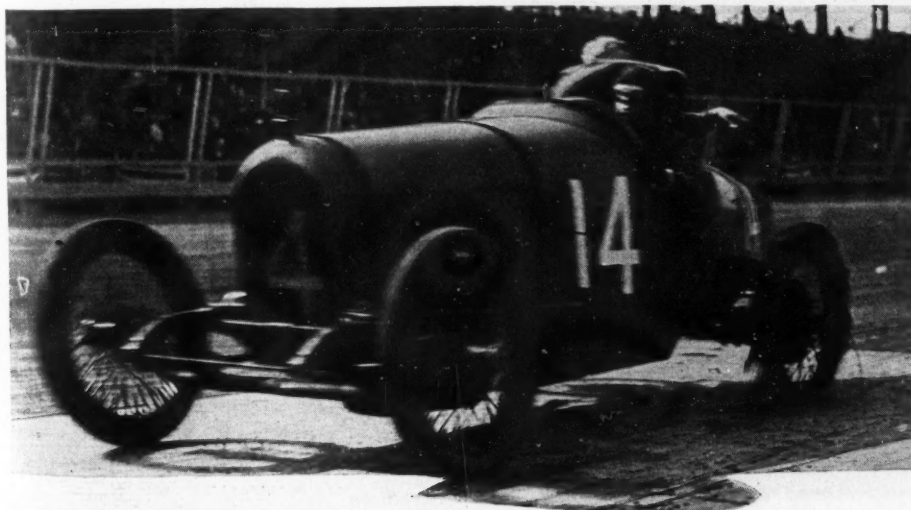
ed by Chairman Kennerdell. Where Rickenbacher was given 600 points for first in the New York event, Resta counted 900 at Indianapolis. This gives him a lead of 300 over Rickenbacher. Points at Chicago were the same as for Indianapolis.

It had been assumed that Rickenbacher would be given credit for a few points at Indianapolis because he took Henderson's Maxwell and finished it sixth. This brought up for the first time the question of whether or not relief drivers should be given credit for their performances. Therefore Chairman Kennerdell has ruled that the points shall be awarded only to the driver who starts the race in the car that is in the money, it being held that after a driver has started and broken down he has had his chance and should not be given another opportunity. This ruling therefore prevented any award being made to Rickenbacher for his relief drive at Indianapolis.

Twenty-one drivers now figure in the championship table, the standing after the Chicago derby being as follows:

Dario Resta.....	1,800
E. V. Rickenbacher.....	600
W. D'Alene.....	510
Jules Devigne.....	320
Ralph Mulford.....	240
Ira Vail.....	220
J. Christaens.....	370
C. J. Devlin.....	90
Barney Oldfield.....	80
George Adams.....	55
Howard Wilcox.....	40
Bert Watson.....	35
Art Johnson.....	30
Billy Chandler.....	25
P. Henderson.....	22
O. Hibe.....	20
O'Donnell.....	130
Galom.....	80
Gable.....	30
McCarthy.....	25
Lewis.....	20

All speedway events this year will not carry the same number of points to be awarded. The figures for each race will be announced by the American Automobile Association before each race and standing made public after each event.



McCarthy's mechanic is pointing at the left rear tire, which is torn to shreds, to warn the pitmen of the need of a change

Resta and DePalma Duel

Match Race Between Two Rival Drivers on Chicago Speedway June 18

Purse of \$5,000 Reward for Test of Master Driving Supremacy

CHICAGO, June 13—Resta in his Peugeot and de Palma in his Mercedes, winners of first and second place in Sunday's 300-mile race on the Chicago speedway, have agreed to a match race to take place on the local track Sunday, June 18. They will race to determine which car and which driver is supreme, as the claim has been current that Resta's winning was a matter of luck and that his rival's Mercedes is the faster car.

Arrangements call for a series of three heats, one of 10 miles, one of 24, and a third of 50 miles. The two best out of three declares the winner. A prize of \$5,000 has been offered by the speedway management, and a A. A. A. sanction is already filed. Neither of the drivers wishes it to be understood that this is a challenge race. De Palma wants to show his friends who have claimed that his traditional hoodoo lost the race, that their assumptions are justified, and Resta's plans are to give proof that the race was won because he drove his blue Peugeot faster than any other pilot and could have done even more, according to the statements of both drivers.

The agreement had its embryo when the ten prize winners appeared yesterday at

the speedway offices for their checks. Speedway officials took to the idea like a dog takes to a hambone, and application for a sanction was on the way to the A. A. A. offices within a half hour. An enormous crowd should greet the duel, as the admission prices are extremely reasonable for such an event. Boxes and parking spaces list at \$2, grand stand seats \$1, and 50 cents a seat for the bleachers.

GALESBURG PROMISES LIVELY RACE

Galesburg, Ill., June 11—Many famous drivers have been secured for the annual motor car races here, on June 20. Director John C. De Long has been in Chicago for the past 2 weeks, lining up many of those participating in the Speedway event of June 11. C. G. Harrington will enter a Mercedes. Fred Dusenbergs agreed to enter two cars. Tom Alley, Andy Burke, Billy Chandler, John Aitken, Gil Anderson, and others are also assured. Fred Wagner has been secured as official starter. L. A. Hilman, Chicago, will be in charge of the score board and timing. Clifford Ireland, Peoria, will serve as referee.



Boscho trophy to be awarded champion speedway driver at end of season

DePalma Sets Hour Mark

Mercedes Covers 93.72 Miles in 60 Minutes on Chicago Board Track

First Trial of Its Kind on American Banked Speedway Ovals

CHICAGO, June 11—An event of nationwide interest in motor racing took place at the local speedway yesterday between qualifying trials for the annual derby when Ralph de Palma, in his Mercedes, established a new American record for distance covered in one hour's time, driving on a speedway track. In the 60 minutes he covered 93.72 miles.

This is the first hour trial made in this country since the inception of banked speedway tracks, although there has been great rivalry on the Brooklands track in England for a number of years in this particular event.

De Palma's speed at intervals in the journey was:

Laps	Elapsed Time	Rate Per Hour
30	39:02.85	92.25
35	47:74.06	91
40	51:45.09	93

OMAHA GETTING ENTRIES

Chicago, June 12—Felix McShane came to Chicago last Saturday to see the race and also to get entries for the 300-mile dash to be held on the Omaha 1¼-mile track July 15. To date he has nine drivers signed up, among them Earl Cooper, who will pilot a Stutz, his contract with the Stutz company permitting him to race west of the Mississippi river. Resta, de Palma and Mulford have signed in addition to two Duesenbergs, Vail's Hudson and the Olsen.

ELGIN EXPECTS LARGE ENTRY

Elgin, Ill., June 13—While negotiations to assure the financial success of the annual Elgin National road race are still pending, assurance of an unusually large field of star drivers has come to promote the event. The Elgin classic is the only road race selected by the A. A. A. as a point winning event in the competition for master driver of the year and the distribution of \$13,500 in prizes, and a \$1,000 cup for the best performances of the year. All other events

Racing Events

- *June 17—Track meet, Newark, N. J.
- *June 20—100-mile race, Galesburg, Ill.
- June 23-24—Interclub reliability run, Chicago.
- June 26—Des Moines, Ia., speedway race.
- July 4—Minneapolis speedway race.
- July 4—Sioux City speedway race.
- *July 4—Track meet, Coeur d'Alene, Ida.
- *July 4—Track meet, Benton Harbor, Mich.
- July 4—Road race, Visalia, Cal.
- July 4—Track meet, Elmira, N. Y.
- July 15—Omaha, Neb., speedway race.
- July 15—Track meet, North Yakima, Wash.
- July—100-mile track meet, Burlington, Ia.
- August 5—Tacoma, Washington, speedway races.
- *August 11-12—Hillclimb, Pike's Peak, Colo.
- August 12—Track meet, Portland, Ore.
- August 18-19—Elgin road race.
- August 26—100-mile track meet, Kalamazoo, Mich.
- *September 1-2—24-hour race, Sheepshead Bay.
- Sept. 4—Track meet, Newark, N. J.
- September 4—Track meet, Elmira, N. Y.
- September 4—Indianapolis speedway race.
- September 4—Des Moines, Ia., speedway race.
- September 4-5—Track meet, Spokane, Wash.
- September 16—Speedway race, Providence, R. I.
- September 29—Track meet, Trenton, N. J.
- September 30—New York, Sheepshead Bay speedway race.
- October 7—Philadelphia speedway race.
- October 7—Omaha speedway race.
- October 14—Chicago speedway race.
- October 19—Indianapolis speedway race.
- October 21—Track meet, Kalamazoo, Mich.
- November 16—Vanderbilt cup race, Santa Monica, Cal.
- November 18—Grand Prize race, Santa Monica, Cal.

*Sanctioned by A. A. A.

Race Entries to Date

OMAHA, JUNE 15

Distance, 300 miles.....	Purse, \$30,000
Driver	Car
De Palma.....	Mercedes
Resta.....	Peugeot
Mulford.....	Peugeot
Milton.....	Duesenberg
D'Alene.....	Duesenberg
Thomson.....	Olsen Special
Vail.....	Hudson
Cooper.....	Stutz
Unnamed.....	Devlin Special

where drivers may collect points for the highest honor in the motor car world are speedway races. Most of them will be held before the Elgin event in August. Consequently, Elgin is expected to be the deciding factor in the campaign for the title of master driver for the season, and the trophies accompanying it. Winners of all of the other events of the season may be forced to enter in Elgin in order to hold their place in the race for the season honors. Entries are already coming in for the Elgin race.

PHOENIX TO STAGE 250-MILE RACE

Phoenix, Ariz., June 12—A 250-mile motor race over a 3-mile speedway will be the principal event of the Arizona state fair. It will be staged on the afternoon of Saturday, November 18, the last day of the fair, and the field will include many of the famous drivers.

This plan, originated by Secretary Tom Shaughnessy, has been approved by the fair commission, which has set aside \$7,500 for prizes. Steps have been taken to secure a sanction from the A. A. A., the idea of holding outlaw races having been dropped.

Shaughnessy has communicated with a number of drivers and believes that there will be at least 20 entries and 15 starters. Most of the leading race drivers of the country will be in the west at that time as the Vanderbilt and Grand Prix races are scheduled to be held at Santa Monica 2 weeks later.

LENS LAW HELD UP

Kansas City, Mo., June 12—The ordinance passed recently by the city council, and signed by the mayor, requiring ground glass on automobile headlights, technically has been put into force, but is temporarily held in abeyance because of extensive objections.

The first objection came from several members of the Automobile club, which had backed the measure; and dealers in accessories have made formal representation to the council committees of their knowledge of facts concerning its operation. The ordinance requires, apparently, that the entire surface of the lens be ground.

Many cases are pointed out in which a slight jar has resulted in the breaking of such ground lenses, and it has been stated that the heat from the lights may cause the lenses to break even without jarring. There are many complaints that the ground lenses do not allow enough light to be cast on the road for safe driving.

It is possible that the ordinance may be amended, so that the character of lenses allowed in other states will be permitted in Kansas City. Technically nearly every motorist who enters Kansas City now is violating the law, because few have lenses of which the entire surface is of ground glass.

Clifton Heads N. A. C. C.

Record Gathering at Annual Meeting Re-elects Its President

Commercial Vehicle Makers Hold a Separate Meeting

NEW YORK, June 10—At a record gathering of motor car manufacturers in connection with the annual meeting of the National Automobile Chamber of Commerce, Inc., this week, Charles Clifton, of the Pierce-Arrow Motor Car Co., was again selected president of the organization.

On Wednesday the commercial vehicle makers in the N. A. C. C. held a commercial vehicle convention at which many standards were adopted furthering the plans for more efficient service to the buyers of trucks as well as of passenger cars.

Substantial gains in motor car shipments for May were reported by the traffic committee, the figures showing that more than 24,000 carloads were shipped, as against 15,392 carloads for May last year. The shipping conditions have become more normal and makers are no longer obliged to use flat cars for shipments.

During the year the traffic department reported on 237,523 carloads of machines and sent 9,523 notices to railroads in advance of the arrival of shipments, so as to insure prompt return of freight cars to manufacturing territory; an assistance to railroads, as well as to the car manufacturers.

The directors elected were John N. Willys, Willys-Overland; C. C. Hanch, Studebaker; R. D. Chapin, Hudson; H. H. Rice, Waverley; and J. Walter Drake, Hupmobile, while at the organization meeting the following officers were unanimously elected:

President—Charles Clifton, Pierce-Arrow.

Vice-President—Wilfred C. Leland, Cadillac.

Second Vice-President—Hugh Chalmers, Chalmers, Gasoline Division.

Third Vice-President—Windsor T. White, White, Commercial Vehicle Division.

Fourth Vice-President—H. H. Rice, Waverley, Electric Vehicle Division.

Secretary—R. D. Chapin, Hudson.

Treasurer—George Pope.

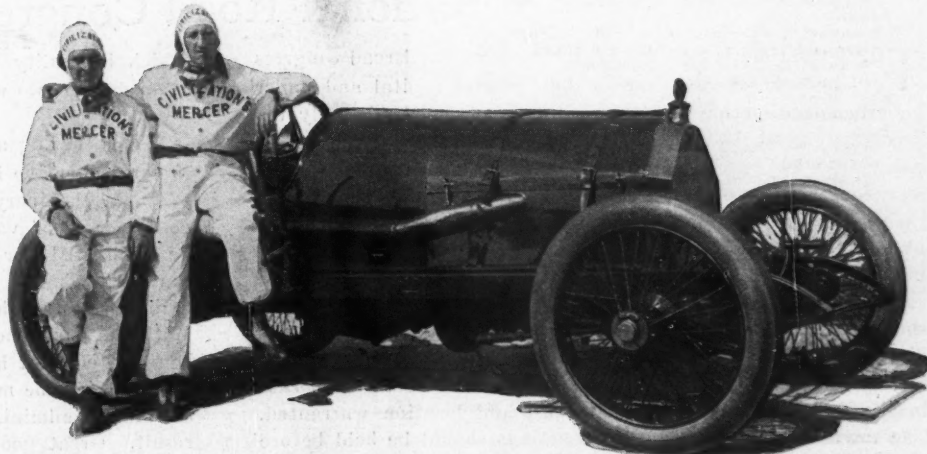
General Manager—Alfred Reeves.

The manufacturers placed themselves on record as opposed to the Tavenner bill now before Congress, which has for its purpose the prohibition of the use of time studies and premium or bonus payments in connection with work of the government. The makers feel that such a bill or any similar measure is dangerous class legislation which would prevent efficient methods in private manufacturing industries and be directly opposed to the interests of the whole population of the country and to the working men themselves, by placing a premium on inefficiency besides reducing the production capacity of manufacturing plants.

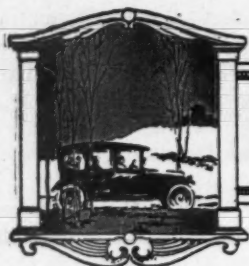
There were reports from various committees on the work during the year, indicating that the trade is enjoying its greatest period of prosperity with apparently no diminution in the demand for American made motor cars in this country and abroad. The figures prove that the greatest proportion of cars are now being bought in districts where distances make the need for a car most pronounced and an absolute necessity for the conduct of business, including the transportation of individuals and freight.

The commercial vehicle convention decided that no truck show was necessary at this time, although the usual successful pleasure car shows will be held in both New York and Chicago. They decided against any change in the standardization of frame widths at this time.

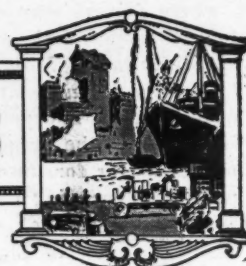
For the protection of buyers of trucks, a standard definition for motor truck chassis, both gasoline and electric, was decided upon and the convention, together with the annual meeting, approved a form of service policy which is expected to supply even better service to the car owner. Almost all the ninety-seven companies holding membership in the N. A. C. C. were represented at the meeting.



Arthur Hanson at wheel, and his mechanic, James McCormack. Hanson is filmland's race champion by virtue of winning the Ascot Movie Meet



EDITORIAL PERSPECTIVES



Need of Traffic-Signalling Devices

SOME idle statistician undoubtedly could prepare a very interesting table on the proportionate yearly increase of the combined traffic police departments of the country, compared with the motor cars which are manufactured every twelvemonth. Were curves to be drawn of the traffic officer increase and the car increase the opinion has been advanced that they would be very nearly parallel. Possibly, too, another curve of the yearly increase in motor car accidents might be inserted on the same paragraph and this constant increase would undoubtedly match up closely with the other two.

IT appears that police departments are far ahead of the car manufacturers in their endeavor to minimize traffic accidents. Although there is a horde of safety signals of every description now being marketed by accessory makers, not a single car manu-

facturer has adopted such a device. Signalling with the hand when a driver approaches a corner and wishes to signify to the driver behind what course he is going to take, is all in all, a most unsatisfactory process and is practically useless in the case of inclosed cars which are increasing in their popularity at a very surprising rate.

EVENTUALLY there is bound to be a prime need for some kind of a positive mechanical device, a part of the car, which can be easily and instinctively operated by the driver. The day is coming when traffic will become so congested that it will have to be regulated with the nicety of an army in review, and the car drivers will take as important a part as the traffic officers in handling the congestion successfully. What manufacturer will be the first to adopt a mechanical signalling device?

Sportmanship in Racing

IT takes a true sportsman to give a good account of himself in defeat. It is hard for most of us to bear reverses with a smile and without a murmur or a complaint. Recognizing this failing of the average person, it is indeed refreshing to encounter so true a sportman as Ralph de Palma.

TWICE in 4 years he has had to taste defeat when victory seemed almost within his grasp, and twice have followers of the racing game been treated to an exhibition of the clean sportmanship of the famous driver. Probably no race pilot has had to smile and show the stuff of which he is made as has de Palma, who in the Chicago race of Sunday met with reverses almost as disheartening as on that well-remembered day at Indianapolis 4 years ago when, with only two laps more to go, and first money easily his, he was obliged to give up because his engine failed him.

DEPALMA drives for all that is in him; if he wins he is not the least bit top-heavy over it; if he loses he is still the same smiling, philosophical Ralph. Few of us can meet defeat so gracefully. Such exhibitions of unadulterated manhood are rare, and the racing game and its followers are to be congratulated on having such men in their midst. Our hats are off to Ralph.

Race Timing and Scoring

THERE is one phase of work at every race meet about which the public knows little and perhaps cares less—that is the work of timing each car as it crosses the starting line. Drivers, however, are keenly alert to timing, and they have a right to be. The timing of a race is no mean task and should be in the hands of a competent force of men hired and paid by the American Automobile Association.

SCORING is another phase in races that needs revamping. Seldom are scoreboards right except for a few cars perhaps. Last Sunday de Palma was shown to be 4 miles behind Resta and Richenbacher up to the 120th mile, when in reality he was less than a lap behind for the entire distance. Something radical should be done to give the public and the drivers accurate information within 1 minute after each lap is finished.

IT seems reasonable to believe that A. A. A. could employ a scoring and timing team to go about the country for each race and not put this important work in the hands of new men at each meet as is done now. If trained men had this work in hand there would be fewer protests heard from drivers immediately after races are finished.

National Road Congress

THAT the time is ripe for beginning a national road congress to be held once a year in the national capital and under government direction is the opinion being quite generally expressed by good roads enthusiasts throughout the country. This point is well taken. Highway conventions should be more numerous and have more of an official character. There should be a good roads meeting in every township in the United States at least once each year, held under the direction of the chief highway official of the township, and a county meeting in each county under the supervision of the county engineer. There also should be a state meeting in each state every year, under the direction of the state highway commission. Then the local motor clubs, good roads associations and others could co-operate in these conventions as their interest and location warranted. The township, county and state meetings should be held before the national meeting, so that at each of the smaller gatherings delegates could be named to go to the national convention,

which in reality would be a great good roads school, lasting from one to two weeks.

IN a gathering at Washington the event could be made most comprehensive in its scope; there could be a complete exhibit of road machinery and road materials; there could be sample construction of various kinds of highways; road schools could be conducted for state, county and township engineers; the various technical phases of the work could be set forth by trained experts who easily could be gotten for such an occasion. With the vast amount of funds being expended throughout the country, efficient highway building is becoming largely a question of scientific management, and if the county were the smallest unit of administration, greater efficiency undoubtedly would result. Great good comes from the interchange of ideas and those who have in charge the building of better highways would profit from such a clearing house of road information.

Goin' After Glory

By Wallace B. Blood

With apologies to Kipling's Danny Deever

"Why are the motors roarin'?" said the drummer in the stand.

"They're tunin' up their stallions," said the leader of the band.

"But why for all this tunin'?" said the drummer in the stand.

"They've got a mind to win some cush," said the leader of the band.

For they're goin' after glory and they're goin' after kale,

And they're whiskin' off their monsters from the snorter to the tail.

There is thirty thousand ducats to go slidin' if they fail,

So they're goin' after glory on the speedway.

"What's all that mawlike rustlin'?" said the drummer in the stand.

"It's pitmen lab'rin' to yrate," said the leader of the band.

"But ain't them mounds all buildd?" said the drummer in the stand.

"They're made o' steel and orn'ry," said the leader of the band.

For they're goin' after glory and their steeds is human built,

And they've got to have 'em perfect or their chances will be spilt.

They've only got to bust a bolt for someone to get kilt,

'Cause they're goin' after glory on the speedway.

"What makes 'em run so even?" said the drummer in the stand.

"They make a lap to start it," said the leader of the band.

"And here they come's a-racin'," said the drummer in the stand.

They're steppin' on the throttle," said the leader of the band.

For they're goin' after glory, with their speeders spittin' smoke.

God pity the tailender, he's an odds-defyin' bloak.

They never heard of danger, they're an awful dev'lish folk

When they're goin' after glory on the speedway.

"What is that man a-flaggin'?" said the drummer in the stand.

"He's announcin' who's the winner," said the leader of the band.

"Most a hundred miles an hour," said the drummer in the stand.

"And a bucket full of silver," said the leader of the band.

For they're done with all their speedin'; it has been a bitter day.

The winner bows to glory in a tired sort of way.

But the loser, all forgotten, ain't a diggin' for his pay:

He has spilt his chance of glory on the speedway.

WHAT TOURISTS SPEND

THIS great movement of intercommunication and travel within the borders of the United States is one of the broadest significance in every way. It makes one of its greatest appeals in a popular sense through the vast and even distribution of money for which it is responsible. A comprehensive idea of what this means to the whole country can be determined by considering the dollars and cents put in circulation along the route of the Lincoln highway, which offers the best standard of comparison because some definite idea of the huge traffic it carries is known.

Various estimates of from 5,000 to 25,000 tourists were made as having used that great thoroughfare for long distance traveling in 1915. It is safe to say that at least 10,000 will use it during the present season. It is estimated that these cars will travel 46,000,000 miles.

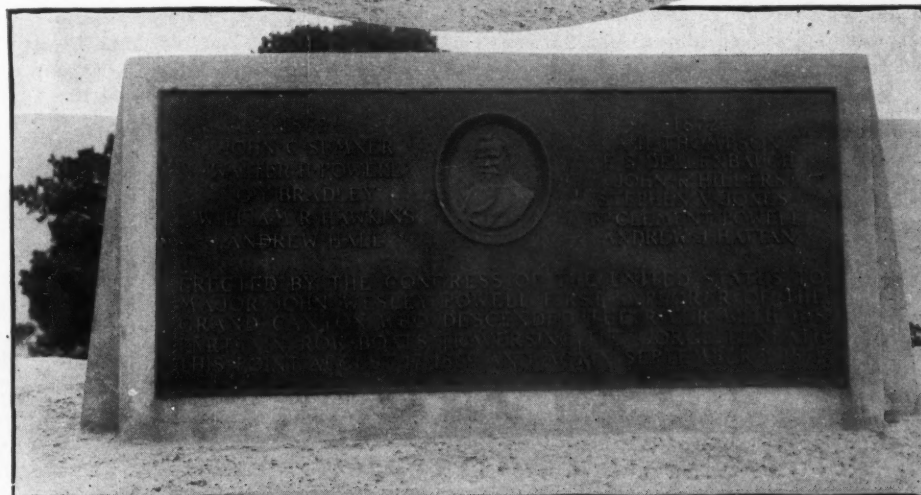
These 10,000 cars will travel on the average ten miles to the gallon of gasoline, using thus 4,600,000 gallons; they will travel 200 miles to each gallon of lubricating oil, consuming 230,000 gallons. They will wear out a set of tires to each 5,000 miles, therefore they will need 9,200 sets of tires. They will spend for:

4,600,000 gallons gasoline @	
\$0.25	\$1,150,000
230,000 gallons oil @ \$0.60..	138,000
9,200 sets of tires @ \$125.....	1,150,000

Total on cars\$2,300,000

It is seen that the motor car and accessory folk along the Lincoln highway are going to do a business of \$2,300,000 as a result of this travel. But this is not all; this money, in fact, all of the money spent by these tourists along the way will eventually find its way into diversified channels into the pockets and tills of every merchant and shopkeeper.

See America First — See America Now



EDITOR'S NOTE—This is the eighty-second of a series of illustrations and thumb nail sketches of the scenic and historic wonders of America to be published in Motor Age for the purpose of calling the attention of motorists to the points of interest in their own country.

NO. 82—TABLET ERECTED FOR MAYOR JOHN WESLEY POWELL

ON the rim of the Grand Canyon of the Colorado the United States Government has erected a tablet to Mayor John Wesley Powell for being the first to explore this great national wonder. Powell made the trip down the Colorado in a rowboat.

Big Merger Has Been Abandoned

Consolidation of Overland, Hudson, Chalmers, and Others Called—Powers Disagree

CHICAGO, June 14—The \$2,000,000 merger which was looked upon as the greatest consolidation in the history of commerce has been abandoned. This merger, which was to unite the Willys-Overland, Hudson, Chalmers and Auto-Lite forces, together with a number of others, was called off this morning on account of complications arising out of the distribution of stock in the new company. Soon after the brokerage offices opened this morning, wires from New York brought a statement from John N. Willys, president of the Willys-Overland Co., and the proposed head of the new organization, in which he said: "Because of complications, the proposed consolidation has been abandoned. Therefore, the Willys-Overland, Hudson, Chalmers and Auto-Lite companies will continue to operate individually."

Reason for Merger

The reason given for the proposed merger was the abnormal state of the raw material market. In view of the fact that every large manufacturing concern this year has suffered more or less severely owing to the unexpected rise in the price of steel and many other commodities, it was felt that the best insurance against fluctuations in the cost of raw material was either for the motor car plants to establish steel mills of their own, or to form combinations of such strength financially that they could take over existing steel mills, thereby absorbing them into the merger virtually if not actually.

Everything seemed to be moving serenely at the time the merger was announced in last week's issue of Motor Age. It was understood that each company in the mer-

ger was to get a certain amount of stock and cash and rumors received here today are to the effect that there was some difference of opinion as to the proper distribution of power.

CALIFORNIA OAKLAND DISTRIBUTION

Los Angeles, June 10—Hawley, King & Co., this city, for a number of years Oakland distributors for the southern part of the state, have entered into a new arrangement with the Oakland company whereby they now have entire charge of the sale of Oaklands in California. Coincident with this announcement, Hawley-King & Co. has made public the establishment of an office in San Francisco, where Reeve Gartzmann, manager of the company, will have his headquarters.

WINDSHIELD PATENT VALID

Cincinnati, Ohio, June 10—The United States circuit court of appeals for the sixth circuit has declared the Hanlon windshield patent invalid and will later lift the injunction against the National Automobile Chamber of Commerce members, after certain technical formalities have been observed. Until that time the members will continue to respect the injunction.

The case in question is particularly important in that many manufacturers are using the Hanlon idea of windshield, which is a double glass with the outer or forward glass divided and the top half adjustable so that it can be inclined forward to serve as a rain vizard if necessary.

The decisions just handed down involve the cases of Rauch & Lang Carriage Co.,

appellant, vs. William B. Hanlon and J. R. Wardrop and Anderson Electric Car Co., appellees, and National Automobile Chamber of Commerce, appellant, vs. William B. Hanlon and James R. Wardrop and Anderson Electric Car Co., appellees.

Cases Are Separate Appeals

These cases are separate appeals from the decision of the United States district court, northern district of Ohio, eastern division, in which the court held the Hanlon reissue patent No. 13,653, December 2, 1913, valid and infringed and ordered an injunction against the Rauch & Lang Carriage Co. and the National Automobile Chamber of Commerce and its individual members.

M. A. D. AFTER THIEVES

Milwaukee, Wis., June 12—A standing offer of \$50 reward for the arrest and conviction of every motor car thief for an indefinite period has been hung up by the Milwaukee Automobile Dealers, Inc., to protect Milwaukee city and county motorists from the wave of thefts of the last few months.

Milwaukee has been afflicted for a long time by a coterie of motor bandits, who proved to be nothing more than joy-riders. Cars were stolen for an hour or two and then abandoned in a badly damaged condition.

The M. A. D. has appointed a vigilance committee consisting of President Alton J. March, Leslie D. Frint, John G. Wolleager, Frank J. Edwards, Ray C. Chidester, Secretary Herbert Bonnell and Treasurer Jesse A. Smith.

Placards have also been printed and mailed to the police, sheriffs, marshals, garage owners, automobile dealers and hotel keepers in twenty counties around Milwaukee, advising them of the standing offer.

GASOLINE IN TANK CARS BANNED

Boston, Mass., June 10—Fire Prevention Commissioner John A. O'Keefe, whose authority to regulate the storage and handling of gasoline in the Metropolitan district of Boston is supreme, has placed a ban on the hauling of the fluid through the streets in the big tank cars of the railroads. The commissioner made a very thorough study of the explosion that caused such tremendous damage at Detroit when some miles of streets were blown up, and then he began to look for possibilities of a like nature in Boston.

He found thousands of gallons of gasoline were being drawn through the streets along the water front where there is much apprehension from fire all the time. So he requested officials of the Union Freight Railroad, Boston & Albany, New York, New Haven & Hartford and Boston Maine Roads to meet him and confer on the problem. It was brought out that the gasoline and oil when it comes in over one line and has to be sent away over another passed over the Union Freight lines in Boston.



"Old Black Bess," the famous old White steamer racer, winner of the first Los Angeles-to-Phoenix race and many other road classics of the West in the early days of the motor sport, has been junked. Above is shown Col. F. C. Fenner, who with Capt. H. D. Ryus, now president of the Oldsmobile Co., of California, won the first desert classic, putting bouquet of flowers on famous old racer just before the junk man took possession of the one-time speed marvel. For several years the old car has knocked around Col. Fenner's ranch, but it was in the way and got to the scrap heap

It was done to save time as the cars could be switched in the suburbs. So Commissioner O'Keefe requested that this be done except in an emergency. The railroad officials agreed to the suggestion. When an emergency arises Commissioner O'Keefe will grant a permit and send a detail of firemen along to see that none of the fluid leaks into the sewers where it might cause an explosion.

RAINIER & LINEBERGER TRUCK

New York June 10—John T. Rainier and Paul N. Lineberger, who have been associated in the motor car business here since 1901, most of the time acting as eastern distributors for leading car and truck makers, are now entering the field as manufacturers. They have organized the Essex Motor Truck Co., which was incorporated May 16 with an authorized capital of \$600,000. Among the stockholders and directors are several well known business men of very strong financial standing, including Gottfried Piel and William Piel of the firm of Piel Bros., Brewers, Christian W. Feigenspan, President of the Feigenspan Brewing Co. and of the Federal Trust Co., Newark; also Adolf Kuttroff and Carl Pickhardt, both of the Badische Company, importers of dyes and chemicals. Gottfried Piel is already interested in motor car accessories, being president of the G. Piel Co., manufacturers of horns, cut-outs, etc. The engineering and designing will be in charge of Carl Neracher, formerly chief engineer of the Willys-Overland and Garford companies.

The company will produce only one model, viz: a 1,000-pound truck, the chassis of which will retail about \$750. It will be composed of high class standard units, including worm drive, and will embody several new and individual features. A few sample trucks are now being put together and quantity deliveries will be begun in September.

The offices of the company are at present located at 299 Madison Avenue, New York City, pending the completion of the factory in Long Island City. Mr. Rainier is president and treasurer of the company and Mr. Lineberger, vice-president.

OTHER CITIES PLEASE COPY

Kansas City, Kan., June 12—This city has a new ordinance prohibiting any person driving a motor car or other vehicle, from tracking the pavements with mud. Any vehicle discovered with mud on its wheels is to be considered as evidence that the ordinance had been violated; though it is understood that officers are tacitly allowed to let the owner clean off the wheels before proceeding, exempt from arrest, if the vehicle is standing when found. The ordinance was passed to assist the street department in keeping the pavements clean, rather than from an esthetic purpose to keep vehicles rendered unrepresentable by coatings of mud on the wheels from marring the beauty of street scenes.

S. A. E. Members on Annual Cruise

Steamship Noronic a Floating Palace Where Ideas Will Be Exchanged for Mutual Benefit

DETROIT, Mich., June 12—Motor car and accessor designers and builders, together with their friends, numbering in all 600, commenced the annual mid-summer meeting of the Society of Automobile Engineers today when the steamer Noronic pulled away from the docks on a 5-day cruise of the Great Lakes. The engineers are following their custom of combining business and pleasure in their mid-season convention by conducting their more serious professional and business sessions while cruising Lake Huron and Georgian Bay. This is the fourth of the summer meetings on the lakes and promises to be the most interesting in developments for motor car owners.

One of the best of the papers to be presented is the Future Scientific Development of the Automobile, by C. F. Kettering, the Delco engineer. It is anticipated that this will arouse some lively discussions, as probably no two men have the same idea as to just what form future development of the motor car should or will take. Another that is expected to prove of interest directly to the owner is the paper by Professor David L. Gallup of Worcester Polytechnic Institute, on Car Performance, in which he suggests a method of testing cars and giving them a rating based on a number of factors, such as speed, acceleration, economy, etc.

Other papers of special interest are Aeroplane Engine Developments, Mechanical Transport Mobilization, The Automobile Engineer and Industrial Preparedness, Kerosene versus Gasoline in Standard Automobile Engines, The Farm Tractor, and Automobile Experiences in the Great War, by W. F. Bradley, Motor Age's special war correspondent.

Very complete arrangements have been made for the lighter side of the meeting, one whole day being set aside for play at Killarney, where fishing and boating parties have been scheduled. In addition, an evening has been set aside for each of the sections to present entertainment features. The Noronic returns to Detroit Friday evening, June 16, ending the meeting.

BAY STATE PASSES DRASTIC LAWS

Boston, Mass., June 10—The Massachusetts legislature ended its sessions a few days ago and one of the final things it did was to put on the statute books a law designed to curb reckless and drunken motor car operators. But it opens the door to all kinds of persecution, and may be a forerunner of more friction such as the trap systems of old.

The bill provides for a minimum fine for one found guilty of driving recklessly, or while under the influence of liquor, or so

as the lives or the safety of the public might be endangered, etc. As some judges in Massachusetts hold, and have convicted men who had taken but one drink, saying that even one drink places a man under the influence of liquor, and policemen often charge drivers who were going a little too fast with endangering the lives and safety of the public, it leaves the door open to many convictions.

It says no new license shall be issued for 1 year after date of final conviction for driving while under the influence of liquor for a first offense, or 5 years after any subsequent offense. For violation of other sections it provides a 60 days suspension for first offense and 1 year after any subsequent conviction.

LUDWIG OPEL KILLED AT VERDUN

New York, June 10—According to advices from Copenhagen the well-known German motor car manufacturer, Ludwig Opel, was killed at Verdun in May.

MEXICAN OIL COMPANIES BOOM

Tampico, Mexico, June 10—As an evidence that the larger foreign interests which have oil holdings in Mexico are confident that the present depressed condition of the industry will soon be relieved by an improvement in the political and financial situation of this country several large purchases of oil land leases have been made by them during the last few weeks. These transactions were given the official approval of the de facto government, as was recently decreed by Carranza. It is stated here that the Texas Co., which now obtains a daily output of about 10,000 barrels of oil from its wells in the Tampico region, plans to enter the Mexico field on a big scale as soon as conditions here become more settled. It has obtained options on large tracts of oil producing land, which it will develop.

Development operations upon a scale, such as was never before witnessed in any oil region in the world, will be inaugurated in this part of Mexico as soon as assurances are felt by the investment interests that political and industrial peace has come to Mexico to stay and that the government will not overburden them with taxes and restrictions. It is authoritatively announced by the Lord Cowdray syndicate of London, Eng., which is operating in Mexico under the names of the Mexican Eagle Oil Co. and S. Pearson & Son, Ltd., that it has appropriated \$75,000,000 American gold or 15,000,000 pounds sterling for expanding its oil industry in Mexico. This vast sum will be spent in boring wells, laying pipe lines, enlarging its two refineries and the building of at least one additional,

Tungsten Miners Become Rich Over Night



The main street, Randsburg, Cal. Before the tungsten boom there were two motors in the town. Today there are 200, and often 300 parked in the streets at one time. There are three garages, all doing a big business.

Stories of Rapid Accumulation of Wealth Sound Like Dream Pipe Smokers' Tales

By Al. G. Waddell

ATOLIA, Cal., June 10—California is enjoying one of the greatest mining booms ever recorded in the metallurgic annals of the Golden West; but it is not gold that is making California history today. It is tungsten.

A red clay bank on the side of a desert wash, means as much to California mining history today as Sutter's Mill. This red clay bank, less than a mile from the center of Atolia, marks the spot where tungsten ore was first located.

More than 20 years ago a German prospector panned the red clay on the side of the desert wash for gold. Gold was found, but there was something else in the clay, heavier than the gold, and the gold could not be taken out. The German prospector gave up in disgust; and now, with the warring nations of Europe clamoring for hardened steel for machine tools and engines of destruction, gold is forgotten. That heavy mineral that was worse than worthless to the German prospector is worth more than gold and is responsible for Atolia, the tungsten capital of the world.

Yellow Aster Mine Forgotten

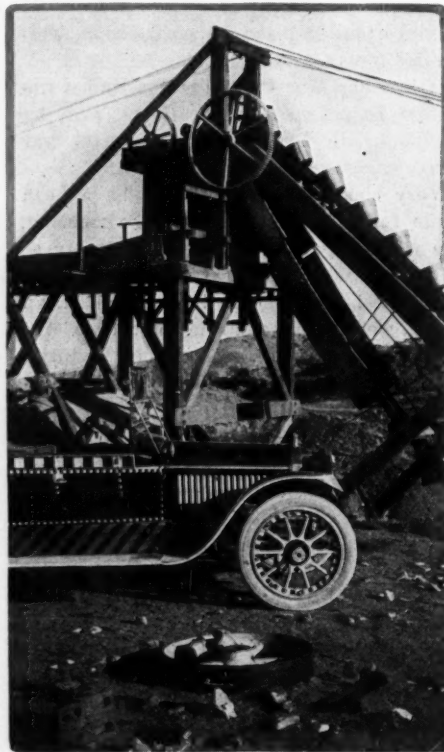
For many years Kern county has boasted of one of the richest gold mines in the world—the Yellow Aster. Now the Yellow Aster is forgotten. Kern county boasts of rich tungsten mines.

Randsburg, the mining town formerly supported by the Yellow Aster and the Sunshine, and Atolia, are now in the center of 18 square miles of rich tungsten claims. Last month these desert claims produced \$2,000,000 in *E. Pluribus Unum*.

A hitherto comparatively little known

mineral, named after the great Swedish chemist Scheele, and called Scheelite, is responsible for the rejuvenation of Randsburg and the mushroom growth of Atolia.

Previous to 1900 the production of tungsten ore in the United States was insignificant. The greatest production since that year, to and including 1914,



An electric dredge for taking out tungsten ore

was in 1910, when 1,821 tons, valued at \$832,992, approximately \$450 per ton, were produced. And today storekeepers of Atolia and Randsburg are trading grubstakes for high grade—60 per cent—tungsten ore at \$3.50 per pound.

Atolia is just 6 hours from Los Angeles by motor car. It is a city of numbered days—a boom town thrown together with canvas and rough pine boards, like the boom towns of Nevada's gold days; but as long as the European powers demand tungsten and the motor car manufacturers of America clamor for tungsten steel, Atolia will continue to prosper as well as her older sister city, Randsburg.

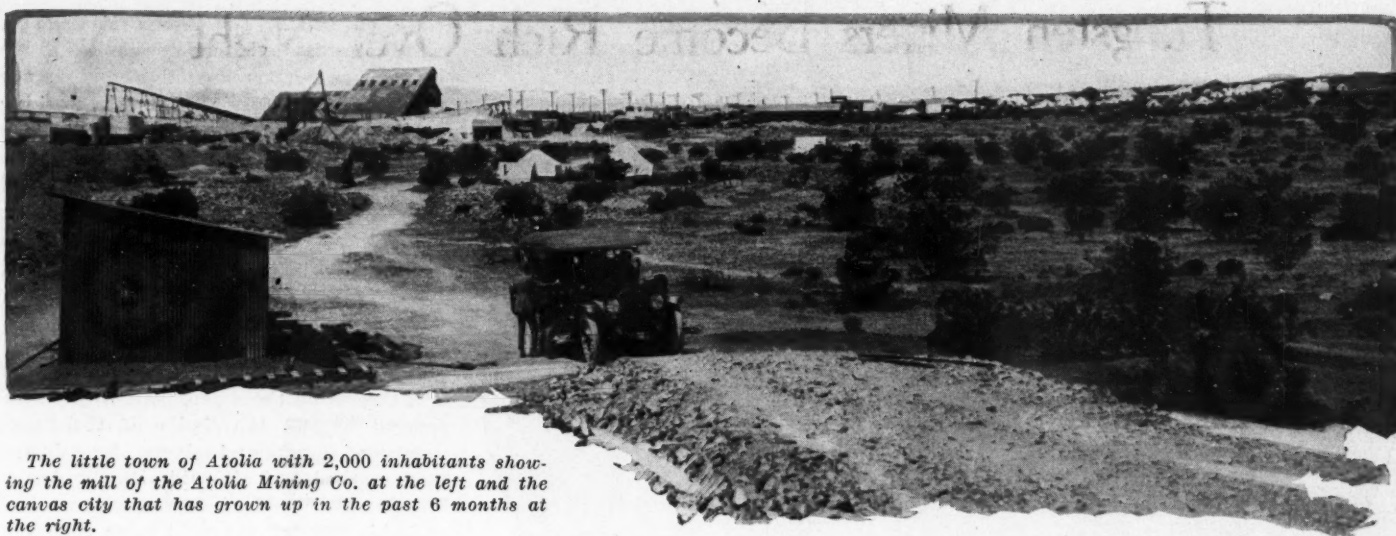
Increase 1500 Per Cent

A few months ago Atolia was a sleepy desert mining town. Tungsten was worth something like \$6 per unit—1-100 of a ton—and the Atolia Mining Co. was supplying the demand with a small crew at work in the mine and mill. Then the war orders began to roll in. There was a great demand for the minerals used to harden steel. Tungsten ore jumped to \$90 per unit and the population of Atolia jumped to 2,000.

When tungsten first jumped there were two motor cars in Randsburg. Now there are about 200 to be seen on the streets most any evening. There are three garages and room for another one.

It is the same at Atolia. There are touring cars, motor trucks, motor stages, stripped near racers and motorcycles, all paying tribute to John D. and eating up a small portion of the fabulous diggings of the tungsten barons.

In the tungsten fields the burro, which



The little town of Atolia with 2,000 inhabitants showing the mill of the Atolia Mining Co. at the left and the canvas city that has grown up in the past 6 months at the right.

played such a prominent part in the boom days of Goldfield, Nev., is a minus quantity. Every prospector, miner, operator, leaser and owner rides in a motor car. Instead of the burro hobbled near the miner's shack as in the Goldfield days, or the pack of sled dogs circled around the prospector's fire in the frozen north as in the Klondike rush, a motor car stands parked in the scant shade of a cholla, Joshua tree or some other specimen of cacti.

Windshields Flash Like Heliographs

Under the glare of the cruel desert sun the windshields of these cars flash like heliographs of an invading army. At night, as the miners drive into town or back to their claims, the lights of the machines look like tiny glow-worms out on the desert, crawling between the rocks and cactus growth; but they are not crawling.

There is no speed limit in the tungsten

fields. Anything goes on the main street of Randsburg and there never was an arrest made for speeding on the congested artery of Atolia. There is a sign prominently displayed at one end of the main street of Atolia announcing that 10 miles per hour is the limit, but if any driver came within 10 miles of the limit he would be a curiosity. The citizens of Atolia and Randsburg are too busy taking coin of the realm out of Mother Earth to pay any attention to speed limits.

From early morning until dark the tungsten hunters pan their diggings, swing pick or heave shovel.

If there are two miners on the claim, one guards the diggings while the other dashes across the desert, like a Phoenix road racer, to town for supplies, the daily paper from home and the mail. If the owner of a claim is alone, he will wait until just after dark, then make a fast run to town and rush back to sleep beside

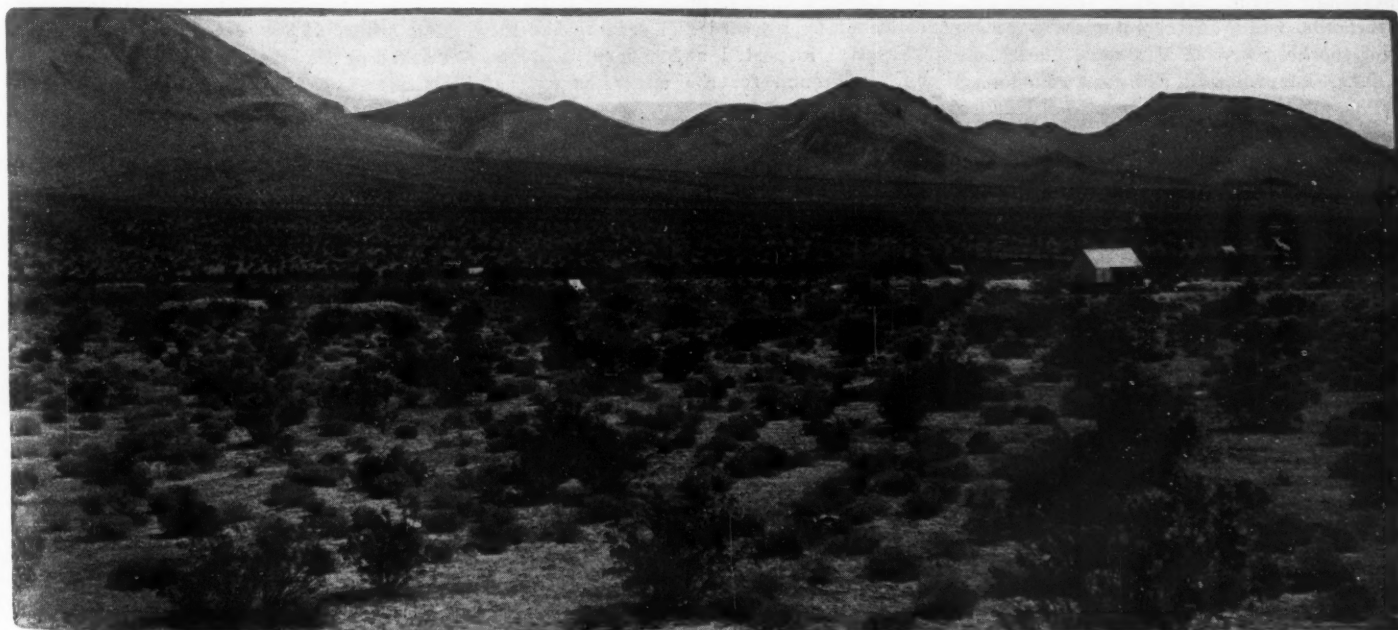
his shaft and sacks of ore.

These tungsten miners are too busy piling up fortunes even to repair their tires. When a tire blows or is cut to the rim by a sharp rock, it is run flat until the owner happens to town again. On one of his brief visits he will turn his car over to one of the garages and while he is eating a hasty meal a new tire is put on.

Business Booms

Six months ago all the tires and accessories needed in the tungsten fields were housed in a small store room adjoining the Illingsworth & Dunnell store. Today Illingsworth & Dunnell have a newly completed garage building across the street from the general merchandise store and the outside men representing the large accessory wholesalers and branch tire houses are making Atolia and Randsburg regularly.

There are motor stages running between Atolia and Randsburg. Others make the



On the tungsten claims near Atolia. The motor car has taken the place of the burro in tungsten mining. The miner has his tent on his desert claim beside his shaft and instead of the hobbled burro a car is parked beside the tent. In the morning sun the windshields on the miners' cars flash like heliographs scattered over the desert for many miles, and at night, as the miners drive to Atolia and Randsburg for supplies and the mails they look like tiny glowworms on the desert roads



Panning out \$7,000 in 4 days on the Sunshine property between Randsburg and Atolia. Note the woman in the center wearing overalls and the pile of tungsten "spuds" on the canvas in foreground

run to Barstow and on to San Bernardino. Powerful machines cover routes across the desert to Mojave, where they connect with the Southern Pacific. These machines haul trailers and freight supplies as well as doing a large and profitable passenger business. There are a few drivers who run clear into Los Angeles. Only powerful machines are used on the long run and, with a load of passengers, these roll along at 40, 50 and even 60 miles an hour over the boulevards, never doing less than 30 on the desert roads. On the shorter runs there are Fords, Maxwells, Dodges and Overlands, while on the intermediate runs over the desert roads Mitchells, Chandlers, Buicks, Auburns and Reos are common.

The miners working for wages ride to and from their work in motor cars, returning to town in the evening. There are desert jitneys that go anywhere any time and the passengers can pay their fares with either coin or tungsten. Tungsten ore is just as good as money in Atolia and Randsburg.

Change Rock for Groceries

Illingsworth & Dunnell accept tungsten ore in exchange for groceries or buy it outright. This firm has taken in more than \$200,000 worth of ore since January 1 and there are other tungsten buyers in Atolia and Randsburg. Eastern manufacturers have buyers on the ground who bid for lots of tungsten ore just as wheat buyers and cotton buyers bid for crops.

The stories of riches from Atolia and Randsburg sound like the wildest dreams of a hop smoker; but to visit the tungsten fields and see grizzled miners driving across the desert with thousands of dollars worth of tungsten ore in the tonneau

of a motor car, to be turned into cash as soon as they reach town, or a buyer being refused a pile of rock the size of an office desk after he has offered \$21,000, makes the visitor feel like a dream pipe stoker from San Francisco's Chinatown. Goldfield, Nev., had nothing on Atolia and Randsburg even in her palmiest days.

This tungsten ore is so valuable that the hired men are watched like the laborers in the South African diamond mines. They are not allowed to carry their own dinner buckets out of the shaft. As soon as they are through eating, their dinner pails are collected by a guard and sent to the top. They are inspected and placed in a row on the ground for the miners when they

come off shift. The Atolia Mining Co. will not allow visitors to go down the shaft, even with credentials signed by the governor of California. The men working in the Atolia drifts are made to change their clothes after coming out of the hole.

Before tungsten went up a man could have high-graded a fortune in a month; but the stuff was worth about as much as granite at that time and no one wanted to carry around a lot of rock worth a few hundred dollars in ton lots only.

When tungsten was down, only the high grade was used. All the low-grade ore was thrown on the dump. When the price jumped beyond the limits of the finest dreams of owners and miners, these dumps were worked and all paid rich dividends. The dumps of gold mines were also worked and this cast off ore paid more than the gold ore.

Quit Gold for Tungsten

The Sunshine gold mine has been shut down and the owners are taking out tungsten. For years this mine has produced gold. One Saturday afternoon a few weeks ago Jess Jewett, who has the lease with C. G. Illingsworth, started to dig a ditch. He struck tungsten and by noon the following Tuesday \$7,500 had been taken out of one small hole and there was \$10,000 more in sight.

A young stage driver stopped to change a tire on the desert, pulling off the road to allow room for other cars to pass on the narrow highway. He started to scrape a place in the sand to place the jack and chipped off a piece of tungsten ore. He put the Scheelite in his pocket and later in the day filed location papers. Now he uses his motor car to haul sacks of ore to the vault of a tungsten buyer and has more than \$10,000 in the bank and has refused \$25,000 for his claim.

Two young men walked into Randsburg flat broke. They secured a lease to be worked on a percentage basis and a month later had \$7,200 in the vault of the Il-



The owners refused \$21,000 for the pile of tungsten ore at right, taken from a small claim just off the main road between Atolia and Randsburg

lingsworth & Dunnell store in Atolia, Cal.

J. A. Tompkins, who mined silver in Mexico until things got too hot for him, showed up at Randsburg and took over an old deserted gold mine known as the Gravel Placer. With three men working for him he averaged \$150 per day for 30 days and took out one nugget that brought \$140.

Two men named Tait and Baker refused \$21,000 for a pile of ore that could be carried away in the tonneau of a touring car when the bidder was jingling gold coin in his pocket.

S. E. Vermilyea, a well known Los Angeles mining man, purchased a lease for \$2,000 and thought he would be lucky to get his money out of it, after he had spent a few days digging. Three days later one of his men struck a piece of high-grade that belonged to a pay ledge. The next morning a visitor called and asked if he would take \$25,000 for the claim. Vermilyea did not sell, but says that he might sell for \$50,000.



Mr. and Mrs. Jesse Jewett guarding tungsten ore on Sunshine property

Caring for Crippled Soldiers in France

Many Positions Opened to the Men, Who Show Marks of War

PARIS, May 10—One of the present and increasing problems of all European nations is how to provide for the thousands of men who have been mutilated in the war. The motor car appeals attractively to many who have left an arm or a leg on the field of battle. Although the average man finds that he can fully employ a couple of legs and a pair of arms in driving and caring for a car, the experience of the last few months has shown that a man with either one of these limbs removed can develop into a first class chauffeur.

Necessity Knows No Laws

The accompanying illustration shows one particular case of a Frenchman who lost his right forearm in the Battle of the Marne. When he had recovered from his wounds and was about to be sent to the artificial limb department for a hand and arm which would look as much like the real thing as it is possible to make them, the subject of this illustration asked to be supplied with a special limb which would enable him to take up his old profession of motor car driver. At the end of his stump, and at right angles to it, he had fitted a short metal tube. He can hook this on to the brake and change speed levers and perform the two operations of changing gears and braking with as much dexterity as the man possessed of all his members. The tube is also designed to fit over the ignition and throttle levers on the steering wheel, and if put between the spokes of the wheel will hold the car on a straight course. After receiving his artificial limb, this particular driver went through a course of training and at the end of a few months presented him-

self for a new government driving license. For his practical test he was made to handle an ordinary car with the usual three pedals, two levers, and throttle and ignition levers, in the busiest quarters of Paris. He did his work as well as the average man with all his limbs, and in consequence was given a license to drive. His only peculiarity is that he cranks the motor with his left hand.

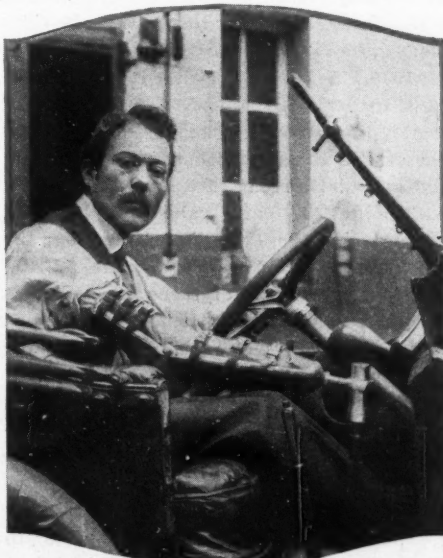
Paris already has an officially appointed one-armed taxicab driver—a former soldier who lost his left forearm on the battlefield and got a military medal in return. He drives a Ford which has not been modified in any way, and is able to manipulate the throttle as dexterously with his

wood fingers as any man with natural digits. This driver only got his certificate after close examination in Paris traffic, recognized as the most difficult in the world.

Artificial limb-making has reached such a degree of perfection that men who have lost a leg below the knee are being equipped to drive cars with standard control. When the whole of the leg has been shot away the car generally has to be modified so that clutch and foot brake are combined, the control of the motor then being by means of the levers on the steering wheel.

Aid Agricultural Workers

In France an organized attempt is being made to equip agricultural workers who have lost a limb for further service on the land. Gasoline motors and power-driven agricultural instruments are being adopted in big numbers where formerly hand labor only was applied. A school has been opened to train mutilated men to handle agricultural machinery. Men minus one leg or one arm are quite capable of taking charge of a gas engine and the machinery it drives, and of handling gasoline tractors. The school aims at giving these men the necessary mechanical knowledge to work on the land under modern power conditions. It is desirable that men who are already skilled in any one particular branch of industry should, if possible, be fitted to continue that work, rather than fall into the common mass of unskilled workers. Motor car applications to agriculture will doubtless save France hundreds of valuable men who would otherwise be lost to her as skilled workers.



Having lost his arm in the Battle of the Marne, this chauffeur is able to follow his profession with the aid of an artificial limb

Motor Vehicle Exports Continue Increase

Government's Nine Months' Figures Indicate Wide Use of U. S. Machines

WASHINGTON, D. C., June 10—American makers of trucks, passenger cars and parts continue to expand in foreign fields, according to official figures compiled by the statistical bureau of the Department of Commerce. In April this year the number of trucks exported was 1,790, valued at \$5,294,801, while the pleasure car exports totaled 6,242 machines, the value of which was \$4,998,350. The exports of parts, not including engines and tires, were valued at \$1,399,794. For the 9 months' period ended April, 1916, the exports reached these tremendous totals: Commercial cars, 18,135, valued at \$48,898,380; passenger cars, 45,048, valued at \$34,269,158; parts, not including engines and tires, \$18,223,401.

Turning to the figures for last year it is found that during April a year ago 2,267 commercial cars, valued at \$5,240,481; 3,078 passenger cars, valued at \$2,804,741, and parts, not including engines and tires, were shipped abroad, while during the 9 months' period of 1915 the figures were: Commercial cars, 8,580, valued at \$23,977,968; passenger cars, 14,641, valued at \$12,356,472; parts not including engines and tires, \$5,258,175.

While the warring nations of Europe with the exception of Germany, continue as heavy buyers of American-built motor cars, it is interesting to note that countries like South America and the British possessions in Oceania are constantly growing in importance as markets for our cars.

In April last France imported 1,056 cars, valued at \$3,086,601, from this country, while in April a year ago the number was just one less, but the value was only \$1,710,702. The exports to France during the 9 months' period increased from 3,951 cars, valued at \$10,035,842, in 1915, to 62,203 cars, valued at \$16,290,264, in 1916.

Russia a Good Buyer

Russia's purchases of American cars in April last amounted to 178 machines, valued at \$433,825, while during the 9 months' period of 1916 the number was 4,774 and the value \$14,868,354. Russia did not figure in the export returns last year, so there are no comparative figures available.

Germany did not import any American machines in April of this and last year, but during the 9 months of 1915 the returns show that 20 cars, valued at \$20,164, were shipped there.

Seven hundred and thirteen cars, valued at \$870,184, was the United Kingdom's contribution to American motor car makers in April last, which is a decline from last year's figures for the same period, which were 1,455 cars, valued at \$1,925,280. However, during the 9 months' period the ex-

ports there rose from 7,652 cars, valued at \$10,840,309, in 1915, to 16,820 cars, valued at \$22,959,602 in 1916.

There were 73 cars, valued at \$55,452, shipped to Denmark in April last, while during the 9 months of this year the number was 597 and the value \$411,708. No comparative figures for these periods of last year are available.

Italy's share in our automobile export trade in April last was only 4 cars, valued at \$3,073, as against 23 cars, valued at \$9,983, in April a year ago. During the 9 months' period the exports there increased from 88 cars, valued at \$58,368, in 1915, to 256 cars, valued at \$172,731 in 1916.

"Other Europe" imported 395 cars, valued at \$922,988, in April last, as against 855 cars, valued at \$2,535,169, in April a year ago, while the shipments for the 9 months period fell from 2,118 cars, valued at \$6,129,392, in 1915, to 1,745 cars, valued at \$2,259,142 in 1916.

On this side of the Atlantic the figures show that Canada contributed largely to our export trade during the periods under consideration the exports in April last totaling 2,130 cars, valued at \$1,371,108, as against 696 cars, valued at \$611,797, in April a year ago. During the 9 months' period the exports to the Dominion increased from 2,768 cars, valued at \$3,165,739 cars, in 1915, to 7,433 cars, valued at \$5,156,373 in 1916.

Even Mexico a Sales Field

Even war-ridden Mexico is showing an increase in its imports of American cars, the number shipped there in April a year ago being 6, valued at \$4,025, increasing to 47 cars, valued at \$43,897, in April last, while during the 9 months' period the shipments rose from 64 cars, valued at \$63,660, in 1915, to 338 cars, valued at \$328,318, in 1916.

A big increase can be noted in our export trade in cars with the British West Indies and Bermuda, the figures for April last being 497 cars, valued at \$272,099, while during the 9 months of this year the number was 3,860 and the value \$2,345,668. Last year the returns showed that 247 cars, valued at \$119,893, were shipped there in April, while the shipments for the 9 months of that year totaled 1,121 cars, valued at \$696,210.

A striking feature of the automobile export trade is the constantly increasing demand for American cars in South American countries. Formerly the department grouped all the automobile exports to South America under one head and last year's returns show that 98 cars, valued at \$60,437, were shipped there in April, while

during the 9 months' period the number was 906 cars, and the value \$494,488. In April last Argentina alone imported 505 cars from this country, the value of which was \$245,984, while during the 9 months of this year the shipments amounted to 3,497 cars, valued at \$1,630,943. Chile bought 125 cars from us in April last, the value being \$63,814, while during the 9 months' period the number was 704 cars, and the value \$464,555. Only 20 cars, valued at \$12,318, were shipped to Brazil in April last, but during the 9 months of this year the number reached 204 cars, valued at \$127,247. Venezuela's contribution was 47 cars, valued at \$24,718, in April, and 416 cars, valued at \$264,470, during the 9 months of this year, while all other South American countries purchased 40 cars, valued at \$21,419, in April, and 453 cars, valued at \$256,288 during the 9 months' period.

British Oceania a Factor

British Oceania is looming up big in our motor car export trade, no less than 1,319 cars, valued at \$948,367, being shipped there in April last, as against 307 cars, valued at \$270,230, exported in April a year ago. During the 9 months' period the shipments increased from 2,471 cars, valued at \$2,059,033, in 1915, to 6,109 cars, valued at \$5,000,813, in 1916.

Big increases in exports to British East Indies and other Asia and Oceania are noted in the latest export returns.

JORDAN OPENS FACTORY

Cleveland, O., June 13—The new plant of the Jordan Motor Co., for which ground was broken in Cleveland April 1st, was completed and ready for occupancy May 25th.

The Jordan executive and factory organization is now complete and shipments are expected to begin within 30 days. The plant is of the most modern construction, admirably adapted to the production of a high grade car. The details of the Jordan car are yet to be made public.

Only 100 well established dealers will be given selling privileges for the Jordan car, as it is the intention of the company to establish a schedule of deliveries which can be maintained and to provide a system of inspection which will make this car distinctive in the trade, it is stated.

ST. LOUISANS PLAN RUN

St. Louis, Mo., June 12—Members of the Automobile Club of St. Louis and the St. Louis Automobile Manufacturers' and Dealers' Association are showing a sharp interest in the Ozark Trails annual convention, which will meet at Springfield, Mo., June 27 and 28. A large delegation from here will attend. This road promotion is of especial interest to St. Louisans, as it leads into the Ozark Mountain country of southern Missouri and northern Arkansas, which rapidly is becoming a high-class summer residence district for St.

Louis and Kansas City folk. Hundreds of fine summer homes have been erected in the district during the last 3 years, especially in districts where dams for utilization of the water power have created artificial lakes of considerable size. W. H. Harvey, of Monte Ne, Ark., is president.

The run will leave St. Louis at 7 a. m. June 25 and the night stop will be made at Rolla, Mo., 120 miles. The following day will complete the run to Springfield, the second day's distance being 155 miles. Among the cars already entered are the Locomobile touring car, Riker truck, White touring car and truck, Marmon touring, Garford truck, Packard touring. Apperson, Franklin, Haynes, Metz and Dodge machines will be sent on the runs by dealers. The promoters are insisting that no speeding will be permitted, this because some talk of speed tests were heard.

REX BUGGY MAKING TOPS

Connersville, Ind., June 9—The Rex Buggy Co., of this city, which for many years has been actively engaged in the buggy business, has now practically ceased all activities in connection with the horse-drawn vehicle and has turned over the entire plant to the manufacture of car tops and the trimming and painting of bodies.

A neat convertible top is being marketed under the trade name of the Rex-o-dan, and, as the name suggests, it is a sedan type that can be readily converted into a sedan type of car, or used with the plain open sides in the same way as a touring car with the top up. The side curtains can be used with the permanent top and in this way all the advantages of the touring top are maintained.

The side curtains are carried in an envelope formed directly in the front of the top, over the driver's head. They are out of the way and out of sight until they are required, when they can be reached by simply unbuttoning the flap which holds the envelope closed.

A hardwood frame is used in the construction of the sedan top. It is mitered, mortised, glued and screwed together and very substantially ironed to make the top rigid and to eliminate squeak and rattle. The body of the top is constructed of light laths of poplar, covered with wadding and then by a layer of cheese cloth. Over this is placed the weather and waterproof covering. The rear quarters are made with upright bows, which are covered with sheet steel. The steel is also covered with the wadding, cheese cloth and waterproof material. Inside the entire structure is covered with a substantial lining.

An electric dome light with a frosted cut glass rosette is fitted within the top. This is equipped with an Edison socket so that the bulb cannot work loose, and the wiring for this is arranged to be readily attached to the lighting equipment of the car.

Britain's Steam Railroads Use Motors

Nearly 500 Operated Last Year and More Will Be Needed in Future

NEW YORK, June 13—Nearly 500 motor vehicles were owned and operated last year by the principal steam railroads of the United Kingdom. The number was somewhat less than in 1914, owing to the requirements of the war office, which requisitioned some of the vehicles for army purposes. They took, for example, 32 of the London and Northwestern's fleet of 52 omnibuses. It is expected, however, that this year will show a considerable increase.

The British railroads collectively possessed 223 motor buses last year and more than 250 trucks and vans for hauling parcels, baggage and freight. The largest fleet were as follows:

Railroad—	Motor Buses	Motor Trucks
Great Western	109	95
London and No. Western.	20	75
North Eastern	43	17
Midland	2	38
Gt. Northern of Scotland	36	
London and So. Western.	2	27

The Midland railroad doubled its fleet of trucks last year and the North Western increased its fleet 50 per cent.

These road vehicles are used principally as connecting links between the main lines and towns located some distance back from the railroads.

There is a big opportunity for similar use of motor vehicles by the railroads and interurban electric lines in the United States for serving communities too small to make the construction and operation of branch roads profitable.

JACKSON HIGHWAY INSPECTION TOUR

Chicago, June 13—Officials and boosters for the Jackson highway will leave on an inspection trip having Chicago as its beginning and Nashville, Tenn., as its terminal, Tuesday morning, June 20. On the first day the drive will be made through Hammond, Crown Point, and Rensselaer, where a night meeting will be held. On Wednesday they will drive through Remington and Wolcott to Lafayette, reaching the latter city by noon, where the caravan will be entertained at luncheon by the Chamber of Commerce, after which a road meeting will be held. On the afternoon of the 21st a drive will be made through Frankfort and Lebanon to Indianapolis, where another meeting will be held in the late afternoon or evening. The run from Indianapolis to Louisville will be made on the next day.

At present it is not certain whether a side trip will be made to Maysville, on the northeastern division of the Jackson highway from Louisville to Buffalo. Providing this trip is made the party will leave Louisville on the 23d, reaching Lexington that night and Maysville on Saturday evening. The trip back to Louisville

will be made by train on Sunday and the start made for Nashville Monday morning, June 26, making this last leg in 2 days, stopping the first night at Glasgow, Ky.

GARDNER GETS LARGE CONTRACT

St. Louis, Mo., June 12—The revival of river traffic, which recently has begun to loom large to motor car dealers and manufacturers here, received a decided impetus this week through an announcement of Russell E. Gardner, president of the St. Louis Chevrolet Co., that he had obtained the contract for 600,000 Chevrolet bodies because he was favored with barge freight rates on 100,000,000 feet of lumber that will be used in their construction. Also that river barge freight rates figure largely in the distribution of these bodies to assembly plants.

The hardwood will be brought from southern points on river barges which average between 750,000 and 1,000,000 feet lead. The factories to receive bodies from the St. Louis plant are located at Minneapolis, Kansas City, Atlanta and Oakland, Cal. The Kansas City plant is reached by Missouri river barges, which are in regular operation; the Minneapolis plant by the upper Mississippi barges. The Atlanta and Oakland bodies can be shipped by river to New Orleans and then transhipped by Gulf steamers and through the Panama canal. The 600,000 bodies are to be delivered at the rate of 200,000 a year at an average of \$20 each. The St. Louis Chevrolet Co. is completing additions to each of its two plants, at Broadway and Bulwer and Second and Rutgers streets, at a cost of \$50,000 each.

PHILADELPHIA S. A. E.'S MEET

Philadelphia, Pa., June 13—The largest and best meeting that the Pennsylvania section of the Society of Automobile Engineers has yet held and the one which will finish section activities until the October meeting will be on June 22 at 8:15 p. m. at the Engineers' Club, 1317 Spruce street. Members are coming from all parts of the state to hear Mr. Robert R. Abbott, metallurgical engineer of the Peerless Motor Car Co., on the subject, "Commercial Heat Treatments of Automobile Steels." Mr. Abbott is acknowledged as an authority on this subject in this country, and what he will give us it will be impossible to obtain from other sources, as it represents his personal investigations on this important subject.

On account of the general interest, and as this is the last meeting of this season, the section is letting down the bars a little and will make it possible to invite friends who are not members.

How to Care for the Gearset in Your Car

Hidden Secrets in the Speed Change Box Brought to Light

IN an imaginary newspaper announcement the following terse phrases of reportorial ingenuity advise the public of the marital union of two of society's favorites: "At the first placid wedding march strains from the orchestra the bewitching daughter of the millionaire manufacturer of Spotnit soap, followed by a bevy of handsome bridesmaids of the debutante set, glided toward the flower-laden altar on the arm of her fiancé. The dainty bride-to-be was gowned in an imported creation of wondrous Pekinese lace over a bodice of pea-green Mongolian silk. Her flowing bridal veil, etc., etc., etc.," until the bride is drawn, traced and blue-printed from head to foot. Then it ends, "The groom wore conventional black."

Similarly in the advertising announcement of a new car we find "Modernity is the keynote in the motor of our marvelous eight. The reciprocating parts are balanced to a hair's weight. The wrist pin bearings are ground to the greatest accuracy man-made instruments can measure. The carbureter, spark plugs, generator and starter are the most costly devices money can buy. Each fraction of an inch of metal in the entire power plant has been put there for a definite purpose by a force of ninety of the pick of motor car engineers." And then, "The gearset is of the conventional three speeds forward and reverse."

Gearset Design is Old

The prospective bride is a thing of beauty. She is the shining light of the wedding—the motor. The groom is merely there because he has to be—he is the gearset. This tendency in motor car advertising and salesmanship leads the unmechanical citizen who is buying a car for the first time to believe that the mechanism is all in the motor and he has nothing else to worry about. If he has the temerity to ask "What is that box thing there behind the motor?" the salesman's reply would generally be something like this, "Oh, that is the gear box—but let me show you this new idea we have here in disappearing folding seats."

Friend citizen buys this car and carries away with it a headful of jumbled specifications on double-jet-carbureters, overhead valves, floating rear axles, aluminum pistons and what-not, but doesn't know that he owns such a thing as a gearset.

Why this ignoring of a vital car part in motor car advertising? It is because the sliding gearset of today is the sliding gearset of 10 years ago and, compared with the truck driver whose life, like the wheels of his truck, follows a rut, is forgotten because of its sameness. Fortu-

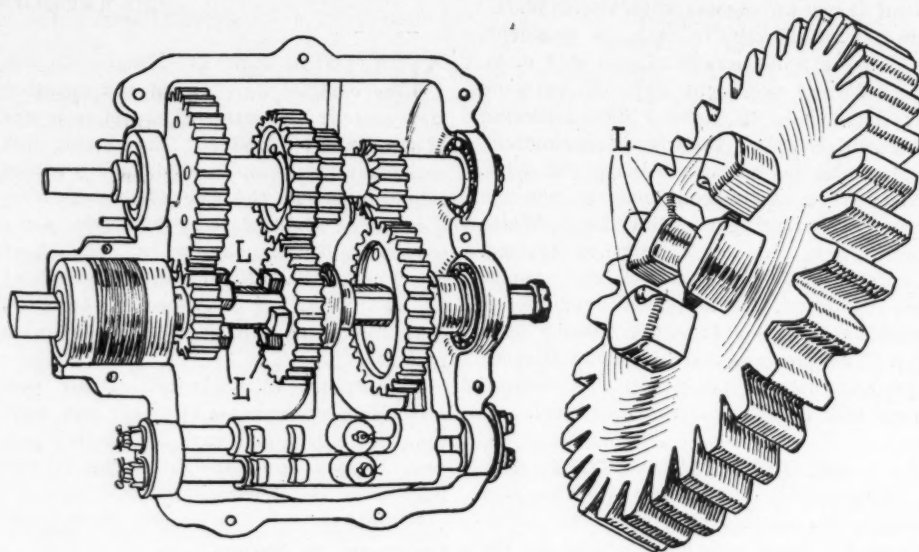


Fig. 1—Typical sliding gearset and dog clutch on driven gear

nately this heart of a motor car, the gearset, is almost as free from trouble as it is from publicity. Like a flowing well, it works until it is worn out—unless something plugs it up.

For reason of its unheard-of-ness, if a gearset does go wrong the car owner usually scratches his head and turns towards the nearest farmhouse to see if that dwelling is blessed with telephone wires. It is the exception, however, when the gear shifting device gives up the ghost altogether. Its most common symptoms of derangement are noisy operation and trouble in shifting gears. If the car owner can remedy the trouble himself he can save garage bills. It is well that he learn his gearset lessons for economy's sake.

Taking, as the first case, difficulty in shifting gears, there are two main reasons for such a trouble, providing it is not caused by a clutch that will not release properly, causing the gears to spin. First, the failure may be in the condition of the teeth of the shifting members. When

these have become burred over on the edge they become an improper fit for the teeth of the gears with which they engage.

Second, considerable wear on the bearings may change the distances between centers of the main and counter gear shafts. Plain-bearing gearsets are especially susceptible to this trouble. Such wear will alter the pitch lines of the meshing gears, possibly to such an extent that the teeth of one gear will stick on the metal side of the other below the bottom of the teeth.

Proper Lubrication

Gearsets, like all moving parts in a motor car that are more or less hard to get at, commonly suffer from improper lubrication. The oiling of this part should be as carefully taken care of as the oiling of the motor itself. If the gears or bearings are not too badly worn, noise can be reduced by use of a slightly heavier grade of oil, possibly a mixture of flowing oil and grease in a fibrous consistency. In practically every type of sliding gearset now in use, a flowing oil is the only satisfactory lubricant. Far too many owners, without investigating its value or harmful effects, cram their gearboxes full of hard grease and then wonder why they have to buy new gears.

The principle is simply this: Hard grease will not soften to a point of flowing until it is considerably heated. The gears cut a path in this grease and run dry until the friction of their running dry has created enough heat to melt the grease into the teeth. In other words, they only become properly lubricated when the friction and resultant wear has brought grease to them. A transmission gear is like a babe in arms. Its food must be brought to it. Neither should

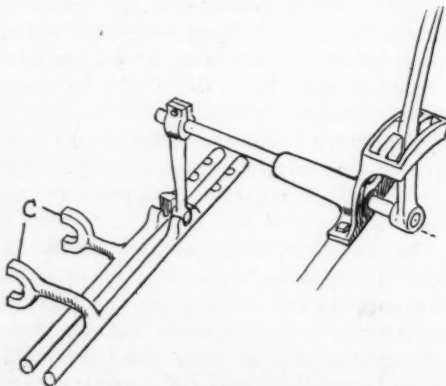


Fig. 2—Common type of shifting device showing shifting yokes

be obliged to go after it. An oil so heavy that it is just on the margin between flowing oil and hard grease will mean the most quiet gears.

Dog Clutches Wear

After a gearset of a motor car has been in hard service for some time, if dog clutches, such as are shown at L in Fig. 1, are employed to effect the high speed or direct driving connections, it often is found that the contacting edges of these dogs become badly worn and rounded off. This condition often is prematurely brought about through the use of poor judgment or carelessness in shifting into the high-speed gears, or as a result of a dragging clutch.

The latter trouble is generally due in the case of a cone clutch either to poor adjustment of the clutch operating mechanisms, or to misalignment between the clutch and flywheel, and in a multiple-disk clutch, to the use of an improper lubricant, warped plates or maladjustment. The care of clutches was explained in the June 1 issue of Motor Age.

However, when the gearset clutch dogs become so badly worn that they cause the gears to slip out of engagement while the car is in operation, or at least make it too difficult to effect the engagement of the dogs, it is time that the teeth or lugs be dressed up. If the wear is excessive a new gear will be needed.

Right here let us insert a warning to the uninformed car owner. Many garage mechanics, to sufficiently soften the dog clutch, will anneal the gear, that is will heat it to a sufficient temperature to take the hardness out of it so that the rough piece may be smoothed with a file. After they have dressed the teeth an attempt will be made to reharden the gear and in seven cases out of ten the rehardened job will not hold up a month in use.

Chrome and nickel steel alloys are used almost universally in gear construction and these alloys to be made satisfactory for use in gears, must be scientifically heat treated under a fixed temperature and fixed time of heating. These processes have been scientifically developed by laboratory tests and the ordinary garageman is not equipped to do the work successfully. Furthermore, the work of dressing the teeth can be done satisfactorily with the use of a small-diameter fine-grain emery wheel. An emery wheel will cut steel that a file will not scratch.

When the cover is removed from the gearbox, as shown in Fig. 1, it is an easy matter to determine whether or not there is wear between the shifting yokes and the slots of the sliding gear members in which they fit. Much wear at this point will mean that the gears will not shift properly.

On selective gearsets there is very little space allowed between the gear teeth and if the shifting yoke wears it may be possible for the shifting gears to rub against one of the fixed gears on the countershaft

with resultant noise. The main and countershaft bearings may also be tested for looseness by attempting to move the shaft up and down with the hands.

If defects are found in the gearset, it should be removed from the car and disassembled as shown in Figs. 3 and 4, and given a thorough overhauling. Gearboxes are supported in the chassis in various ways and the best principle in disassembling is to remove every bolt and nut that seems to support it.

Then, if it still refuses to come out of the car, the particular point at which it remains fastened can easily be located and loosened. Most boxes are of the horizontal divided type as shown in the sketches. The first step is to remove the shifting members shown in Fig. 2, leaving the main shaft and countershaft in place. Next, lift the main shaft, then the countershaft out, which leaves the gear box as shown in Fig. 4. To reassemble the reverse process applies. Gearset bearings are seldom adjustable and, if badly worn, must be replaced.

Misalignment of Bearings

In gearboxes where the shaft ends are supported by single-row ball bearings with no provision for end thrust, misalignment of the ball bearings at the end of the shaft may cause noisy action, the pressure caused by the misalignment creating an end thrust in the ball bearing. The only remedy is to renew the bearing. Noisy gear box action is sometimes produced because of thin aluminum gear box walls which magnify the sound and if the bearings are located in such a way as to set the gear box in vibration when they become worn, these light boxes will be great howl producers.

In the majority of designs, an interlocking plunger device is fitted to the shifting rods to aid in keeping the gears meshed. A usual location for this is shown in D of Fig. 1. V-shaped slots are cut in the upper surfaces of the shifting rods and ball bearings suspended at the end of coil springs within the interlocking plunger are forced, by the effort of the springs, into the slots at different shifting posi-

tions. This tends to create a friction tension holding the gears in mesh.

It is very often the case that one of these springs becomes broken or compressed with the result that the tension is lost and the gears fly out of mesh when under load. A new spring in case of a broken one, or a lengthening of the old will afford a remedy.

ERROR IN KISSEL ANNOUNCEMENT

In Motor Age's announcement of the new Kissel Hundred Point Six, in the June 8 issue, the statement was made that the model 6-42 had been discontinued and that only one pleasure car would be offered by Kissell this year.

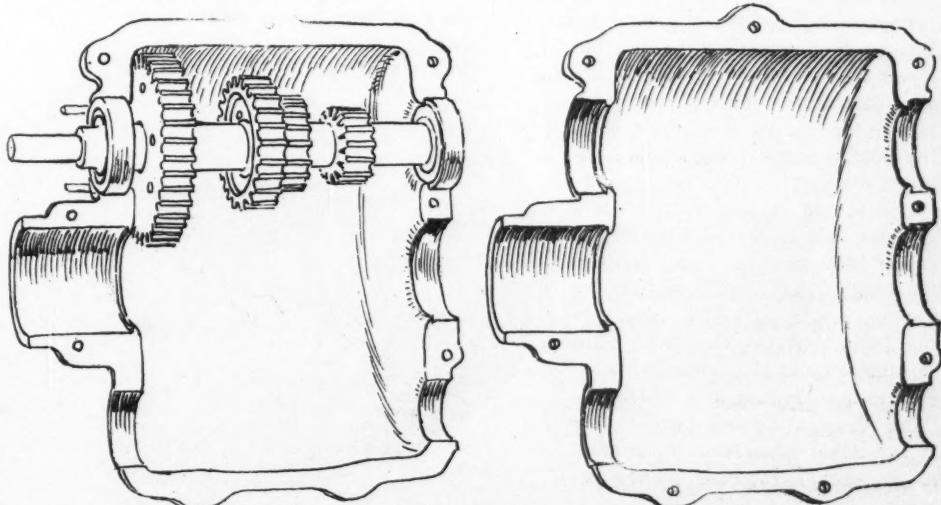
Both statements were incorrect inasmuch as the 42 is still a live model, holding the place of a big six in the Kissel line. It will be continued without change unless the factory decides later to make way for another model for about the same price or more.

The 6-42 is offered either as an open car or an All-Year Car. It has a 3½ by 5½ motor, 126-inch wheelbase, and carries 35 by 4½-inches tires, whereas the new Hundred Point specifications are: 3¼ by 5 motor, 121-inch wheelbase and 32 by 4 tires.

WIREGRIPS FROM LANCASTER

Lancaster, O., June 12—Announcement has been made by the Lancaster Tire & Rubber Co., manufacturers of Wiregrip pneumatic tires, that patent litigation, which practically took the original wire tread tires, formerly manufactured in Hartford, Conn., off the market has all been satisfactorily concluded. In the future these tires will be known and marketed as the Wiregrip with headquarters at Lancaster, where they will be manufactured.

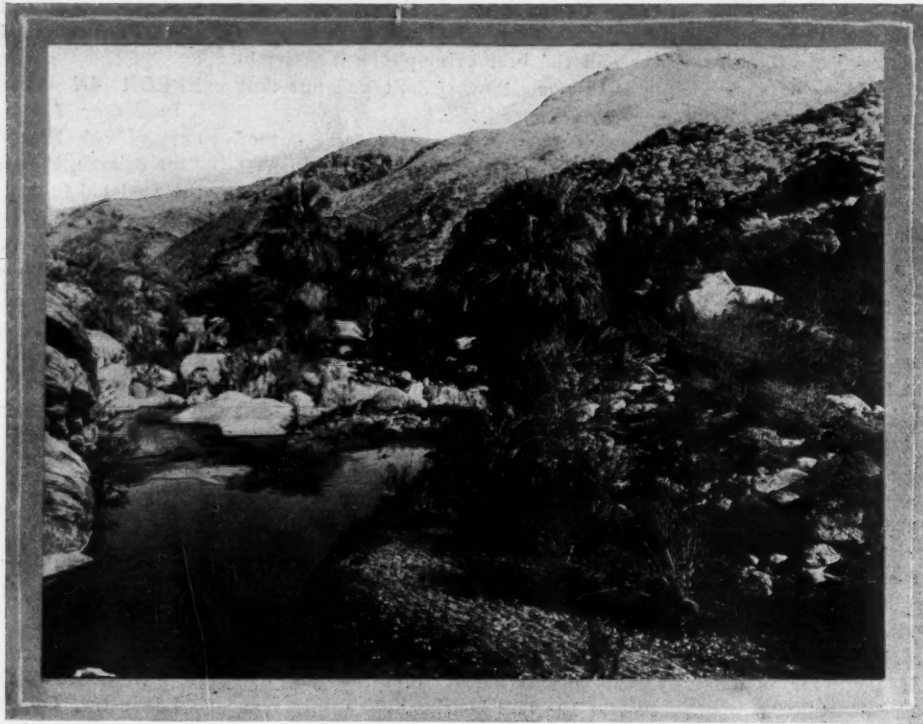
The Wiregrip tire differs from other makes in that it has imbedded in its tread to a considerable depth four endless triangular coils of spring steel. A little wear develops hundreds of little steel prongs which serve the purpose of holding to the road, thus preventing skidding on wet or slippery streets.



Figs 3 and 4—Steps in disassembling a typical sliding gearset

Palm Canyon Counterpart of the Garden of Eden

Sheltering Palms, Flowing Waters and Jagged Cliffs Combined With Charms of the Tropics and Orient



Here is a spot in Palm canyon that is much used by moving picture concerns for tropical settings

ON the edge of the great California desert, at the foot of Mt. San Jacinto with its snow-capped peaks towering to a height of 8,000 feet, yet at the very gates of Los Angeles, is Palm Canyon.

Palm Canyon is a near approach to the Garden of Eden. It is a beauty spot of nature's own making, which awaits the motorist, not only of California, but of America. It is a place of sheltering palms, flowing waters and jagged cliffs—a place with the rare charms of the tropics and the Orient combined.

Region of Indian Traditions

With the exception of the last 5 miles the road from Los Angeles to Palm Canyon is improved highway, or perfect boulevard. The garden spot of Nature lies but a few hours away, from the southern California center, yet it is hardly known to the motorist of the Golden State living a short distance away.

Before the days of Father Serra and his brown-frocked Franciscan friars and the Spanish soldiers, Portola, Fegas and Ortega, Palm Canyon was a gathering place for the Indian tribes of eastern California. It was the center of a region rich in Indian lore and today Palm Canyon figures prominently in the tribal legends of the surviving Indians of the San Jacinto reservation.

The entrance to the scenic won-

derland is just 125 miles from Los Angeles and it is believed to be destined to become one of the greatest motor touring assets of southern California. The concrete, oiled and macadam roads from Los Angeles have been improved through the efforts of Los Angeles, San Bernardino and Riverside counties. The road extends through the White Water Wash, which for years was the terror of motorists on account of its deep and ever-shifting sands and rushing waters during the rainy season. Even against these trying conditions the road has been constructed and Palm Canyon has been thrown open to the motor tourist.

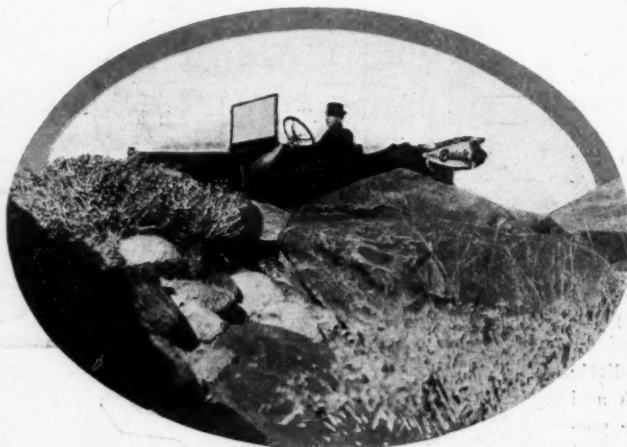
It is approximately 16 miles from one end of the canyon to the other. It is a

palm forest from end to end. In places the palms thin out to lone sentries standing guard in the wind-swept passes, then a sudden turn in the canyon opens up a tropical jungle, where the trees spread the full width of the canyon to the very edge of the rushing stream that dashes down from the upper end. This little stream races through the canyon and is lost on the dry desert at its mouth.

Dashing Stream and Dense Woods

While the palms of the canyon are the main feature, these trees are by no means the only factor of interest to the visiting motorist. The dashing stream, dense palm forests, rock formations, flowers, shrubbery and foliage peculiar to this one canyon, all combine to produce a gem of scenery in this oasis at the edge of the desert, unique and entirely different from anything that California has to offer.

Just how ancient the palms of this canyon are no one knows, and there is no way of determining. Scientists claim that the older and larger trees are several centuries of age. According to the Indian residents, these palms are the progenitors of the oldest palm trees in the mission settlements. It is claimed that the seed of these trees was secured from the Indians by the Fathers and planted in the mission settlements of early California. If this be true, the palms of Palm



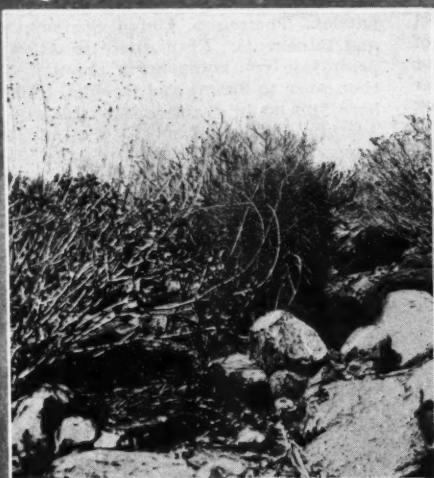
The car almost drops from sight behind the boulders on the road to Palm canyon



Scene on the desert less than 2 miles from the canyon. Note how scenery here differs from that in the canyon

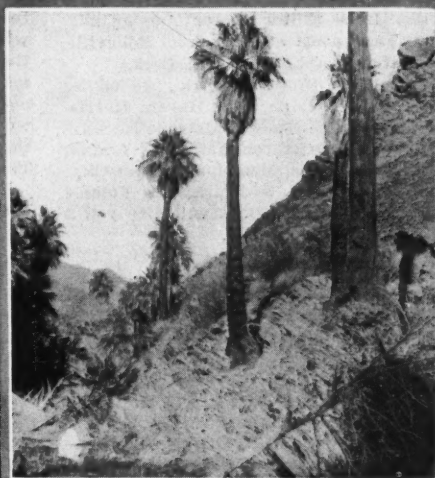


View of Palm canyon, a jungle at the gates of Los Angeles, which combines Orient and tropics with pleasing results



Barrel cactus, which has saved many lives in desert with its water. These are quite frequently found

Below—Palms and cottonwoods afford shelter for the tourist in Palm canyon



The walls of this canyon are clothed with palm trees that make one think of the tropical zone

Below—On the rim of Palm canyon, the line of demarcation between beauty and barren waste



Below—Where a native enthusiast started a new Garden of Eden, 1½ miles from Palm canyon



Canyon are more than 200 years old at the very least.

Just 5 miles from the canyon is Palm Springs. Here the Desert Inn offers the finest accommodations for the motorist and

this hotel in the desert regions of California, with every modern convenience, is one of the reasons for the predicted popularity of scenic Palm Canyon, California's Garden of Eden.

Answers to Inquiries for Road Data

San Antonio, Tex.—Roanoke, Va.

SINTON, Tex.—Editor Motor Age—Kindly give the best route from San Antonio, Tex., to Roanoke, Va., via Memphis, Tenn.—R. R. Rodus.

In going from San Antonio, Tex., to Roanoke, Va., via Memphis, Tenn., we advise that you drive through Austin, Waco, Dallas, Texarkana, Hot Springs, Little Rock, Forrest City, Memphis, Brownsville, Jackson, Nashville, Huntsville, Chattanooga, Lenoir City, Knoxville, Jefferson City, Bristol, Christiansburg, into Roanoke.

Volumes 5 and 6 of the Automobile Blue Book will give you a complete routing for this trip.

Boonville, Ind.—Stuttgart, Ark.

Boonville, Ind.—Editor Motor Age—Kindly give the best and shortest route from Boonville, Ind., to Stuttgart, Ark.—Clyde A. Dork.

On your trip to Stuttgart, Ark., we advise you to go into Evansville, New Haven, Harrisburg, New Burnside, Samoth, Metropolis, Maxon's Mill, then over through Cairo, Jordan, Union City, Brownsville, Memphis, Forrest City, Clarendon, Devall Bluff, to Stuttgart. Volume 6 of the Automobile Blue Book will give you a complete routing for your trip.

Macomb, Ill.—Weldona, Colo.

Macomb, Ill.—Editor Motor Age—Kindly give a route between Macomb, Ill., and Weldona, Colo., also give the mileage.—Louis B. Eastin.

In going to Weldona, Colo., we advise your going over through La Harpe, Ft. Madison, Denmark, Houghton, Hillsboro, Stockport, Birmingham, Libertyville, Ottumwa, Fremont, Cedar, Okaloosa, Pella, Fairmount, Des Moines, Booneville, Earlham, Stuart, Adair, Atlantic, Oakland, Council Bluffs, Omaha, Freemont, North Bend, Schuyler, Columbus, Silver Creek, Central City, Grand Island, Gibbon, Kearney, Lexington, Gothenburg, North Platte, Paxton, Ogallala, Big Springs, Julesburg, Sedgwick, Sterling, Ft. Morgan, then over to Weldona.

Volume 5 of the Automobile Blue Book will give you the complete routing for this trip. The mileage is 875 miles.

Reader Makes Comment

Flemingsburg, Ky.—Editor Motor Age—I noticed an inquiry of B. W. Rowlen relative to an Eastern trip and wondered why you routed him over a route from Columbus to Wheeling other than the National Road. As we will cover practically the same cities you quoted him from Wheeling on, would like you to advise us the best route to be taken July 2, to get from Zanesville, O., to Wheeling.

From Wheeling, we expect to go to Cumberland, Md., Washington, D. C., Baltimore, Philadelphia, New York City, Albany, Syracuse, Niagara Falls, Cleveland and Columbus. We will come through the mountains of northern Kentucky, reaching Portsmouth, O., and up the Scioto Valley route to Chillicothe or Circleville, turning east for Lancaster and Zanesville. Should we leave Chillicothe for Zanesville, or turn at Circleville?—Dudley Garage.

The reason that we do not advise people to go from Columbus to Wheeling over the National Road is because several sections of it are under construction, and the detours are not good. Between Columbus and Zanesville, the road will be closed all summer, and

between Zanesville and Wheeling there are several sections which will be closed until the latter part of June.

In going from Chillicothe to Zanesville, we advise you going up to Circleville, then through Lancaster to Zanesville. If you want to go from here to Wheeling you will find a good connection from Zanesville up to Dresden, then go over to Coshocton, Newcomerstown, Urichsville, then down through Cadiz into Wheeling.

For the trip that you have outlined, volumes 4, 3 and 1 of the Automobile Blue Book will give you complete road information.

Wilmington, Del.—Detroit, Mich.

Detroit, Mich.—Editor Motor Age—Kindly give the best route from Wilmington, Del., to Detroit, Mich. I do not know as yet whether I will make the trip by way of Buffalo or Cleveland, and then by boat, or make the whole trip by road. In the latter event I want to stop over at Altoona. Which would be the most picturesque route and at the same time offer the best roads?—P. C. Thompson.

In going from Wilmington, Del., to Detroit, I think you will find it best to go up to Cleveland and then take the boat over to Detroit. For this we advise that you go up through Downingtown, then pick up the Lincoln Highway going through Coatesville, Lancaster, Harrisburg, Lewistown, Altoona, Indiana, Pittsburg, Rochester, Beaver Falls, Alliance, then leave the Lincoln Highway, going north through Ravenna into Cleveland.

Of course if you wish to go from Cleveland to Detroit by car, then you go through Elyria, Norwalk, Bellevue, Clyde, Fremont, Toledo, Ida, then over to Monroe and north to Detroit. If you take this route, there is not a very good road between Toledo and Detroit and I think you will find it best to take the boat from Cleveland.

Volume 3 of the Automobile Blue Book will give you the routing from Wilmington to Cleveland.

Asks About Routing

Shawnee, Okla.—Editor Motor Age—I am planning a trip to Colorado and would ask you to give me some information regarding the Blue Books for 1916. What is the price, and kindly tell me something in regard to the information I may expect to derive from same.

I am planning to start July 1. I judge from reading Motor Age of May 4 that I would need Volume 5 covering from the Mississippi River to the Pacific Coast.—M. Meek.

The Blue Book that you would need for your trip to Colorado would be Volume 5, which covers from the Mississippi River to the Pacific Coast, and the price of it is \$2.50. The Blue Book not only gives you detailed road information, such as all the necessary turns, bridges, railroad crossings, etc., but also gives you a general summary of road conditions and a condensed outline of the points of interest and historical places that you will pass.

Added to this it gives the names of good hotels and garages that are along this route so that you can also figure out in advance where the next place to stop will be. There is also a brief outline of motor laws for the various states and other useful information which every motorist should know before making the trip.

If you wish further information in regard to the Automobile Blue Book, we advise you writing to the Automobile Blue Book Publishing Co., Mallery Bldg., Chicago, Ill.

Ashville, N. C.—Eufaula, Ala.

Lake Providence, La.—Editor Motor Age—We are planning a trip to Asheville, N. C., and the mountains around for our vacation and would like to go to Eufaula, Ala.

Kindly give a route from Vicksburg, Miss., where we will cross the river to Eufaula, Ala., and from there to Henderson, N. C., via Atlanta, and the approximate distance between the cities enroute.

Kindly state which of the Blue Books we will need to furnish us with a map covering this trip, the price of the book and the address of the publisher.—J. W. Pittman.

In going from Vicksburg, Miss., you will find a fairly good road over to Jackson, then through Brandon, Fannin, Morton, Forest, Newton, and Chunky into Meridian. From Meridian we advise you to go up through Cuba, York, Livingston, Demopolis, Uniontown, Safford, Orrville, Beloit, Selma, Statesville, Autaugaville, and Prattville, into Montgomery.

From here I think you will find the best way to Eufaula to be southeast through Fitzpatrick, Thompson, Union Springs, Midway and Banesville. From there to Atlanta, Ga., we advise you going north through Phoenix, then over to Salem and Opelika. Then from here you go in practically a straight line to Atlanta through Lanett, West Point, Lagrange, Hogansville, Moreland, Newman, Madras, and Palmetto.

From Atlanta, Ga., to Henderson, N. C., your best road is to go through Stone Mountain, Athens, Anderson, Greenville, Spartanburg, Kings Mountain, Charlotte, Salisbury, Lexington, Greensboro, Durham, Raleigh, then north to Henderson.

Volume 6 of the Automobile Blue Book will be very helpful to you. It will not give you the route down to Vicksburg, nor from Montgomery to Eufaula and up to Columbus, but it will give you the rest of the route and it will be a great aid.

Frederick, Okla.—Carlinville, Ill.

Frederick, Okla.—Editor Motor Age—Kindly give the best route from Frederick, Okla., to Carlinville, Ill.—O. L. Phipps.

For your customer who desires to go to Carlinville, Ill., we advise that he go over through Lawton, then north through Anadarko, Chickasha, El Reno, Kingfisher, Hennessey, Enid, Ponca, Medford, Caldwell, Wellington, Wichita, Newton, Florence, Emporia, Ottawa, Olathe, Kansas City, Independence, Levasy, Lexington, Dover, Grand Pass, Marshall, Booneville, Columbia, Fulton, Danville, Warrenton, Wentzville, St. Charles, St. Louis, then north through Granite City, Alton, Godfrey, Medora, Chesterfield, to Carlinville.

We advise you to secure Volume 5 of the Automobile Blue Book for this trip.

Greenville, O.—Bear Lake, Mich.

Greenville, O.—Editor Motor Age—Kindly give the best route from Greenville, O., to Bear Lake, Mich. Give road conditions and distance.—E. A. Weimer.

On your trip to Bear Lake, Mich., I think you will find your best routing by going via Wooster, Ashland, Epworth, Mansfield, Galion, Bucyrus, Upper Sandusky, Tiffin, Fostoria, N. Baltimore, Deshler, Defiance, Bryan, Bridgewater, Fremont, Coldwater, Union City, Battle Creek, Kalamazoo, Plainwell, Allegan, Holland, Grand Haven, Muskegon, Whitehall, Hart, Pentwater, Ludington, Scottville, Manistee, to Bear Lake.

The roads are pretty good until you get up to Battle Creek, then from Battle Creek to Bear Lake they are only fair, and heavy rains are liable to cause you quite a bit of difficulty.

Unique Garage and Overland Station in Paris

Aim to Give France a Showroom and Office of First Order—43,000 Square Feet of Floor Space

OVERLAND headquarters have been established in Paris to handle the sales of this car throughout France. The agency has been taken up by the Malakoff Garage, in the Avenue Malakoff, Paris, with M. Henri Falconnet, one of the leading figures in the French automobile industry for the last twenty years, as the managing director. The location is one of the best in Paris, for the Avenue Malakoff crosses the Avenue du Bois de Boulogne, one of the finest avenues in Europe, and is within a few hundred yards of the Etoile and Champs-Elysees districts. The 43,000 square feet of ground covered by the garage, showrooms and offices were estimated to be worth \$600,000 immediately before war was declared.

The general arrangement of this garage

ing to pay an extra amount to have the car under private lock and key.

At the head of the main drive into the garage is a two-story house, the ground floor of which is used as garage offices and the whole of the upper floor used as a chauffeurs' club. The location of this office is ideal. From the front window there is a view over the whole of the private boxes, over the showrooms and right down to the street. No car can enter or leave the garage without being observed from the office. The left and right side windows of the office give a view over the two collective garages, and the rear window overlooks the covered-in washing yard. The entire floor space above the offices has been turned over to the chauffeurs for their private club. There is a

separate staircase, quite independent of the office, and the garage proprietors make it a rule not to interfere in any way with the club. Thus the club members have appointed their own caretaker and barman, they have made their own rules, and are entirely self-contained and self-controlled. There are billiard, reading and smoking rooms and baths. About 200 cars are garaged. The number is small for the area occupied, but conditions in this part of Paris call for a large proportion of private boxes, which, of course, require considerable space. The unique feature of the garage is the layout by which a big area can be controlled by one man.

For the garage work a well-equipped repair shop has always been maintained. The plant comprises ten lathes, eight drill presses, two planing machines, one mortising machine, three power saws, and a quantity of smaller machinery driven by one electric motor and a gas engine as reserve. A central spare parts depot for Overland cars is maintained and from it agents throughout France are supplied with whatever they need. In spite of the war forty important agents have been appointed in the leading French provincial cities. The only modification in Overlands for the French market is the fitting of millimeter size tires.

TOUR TO YELLOWSTONE

Cody, Wyo., June 10—A motor party will leave here June 21 and during that day and the one following will drive to Yellowstone Park for a meeting of the Yellowstone Highway Association to be held in the park June 24 and 25. The park opens June 15 and this trip will be one of the first of the season.



Entrance to the Overland headquarters in Paris. Note how the exterior differs from garages in this country

is unique. Facing the avenue is a block of five-story buildings divided into two by a central entrance. On the left-hand side two lower floors are used as Overland offices, with an area of 1,600 square feet. Above are fashionable residential apartments. To the right of the main entrance, on the ground floor, is a theater and concert hall which will later be transformed into Overland showrooms. Back of the offices on the ground floor is the Overland show room covering 2,500 square feet. This will be extended later by the inclusion of the theater and concert hall.

The garage is to the rear of the show rooms. It comprises 52 private lock-up boxes, each with natural light, electric light, workbench and lockers; two collective garages, a washing shop, and a repair shop. In this wealthy quarter of Paris private boxes are strongly in demand, clients being readily found who are will-



The entrance to the same garage and station showing decorative features inside court of building

The Readers' Clearing House

Kerosene Not Carbon Remedy, Says Reader

BROOKLYN, N. Y.—Editor Reader's Clearing House—I was glad to note the protest of Mr. Augustine in the April 20 issue against the use of kerosene to remove carbon from the cylinders of motor cars. There would appear to be as many myths in mechanics as there are in medicine and the idea that dosing a cylinder with kerosene over night will remove carbon is certainly one of them, for we see the statement in print very frequently and in almost all instruction books.

In the first place, kerosene does not dissolve carbon, as every chemist knows. There is no substance as yet discovered which will dissolve carbon. For years science has sought for such a fluid because it is believed that if you can dissolve carbon you could crystallize it out again and make diamonds, so the search for such a substance has been most vigorous and persistent. Anyone who desires to test this matter can try soaking a piece of charcoal in kerosene and note the results, or, better still, soak a well carbonized spark plug in kerosene and note how much of the carbon has disappeared after immersion for twenty-four hours.

Kerosene does dissolve or soften thicker oils and if there is a mixture of gummy oil and carbon on the plug kerosene will assist the process of removal by thinning out the oil and making the mixture easier to remove, with a brush or some such instrument.

It is true that if you put kerosene in the cylinders over night, that when you start up next morning a lot of black smoke will come out of the exhaust, but apparently this is simply the carbon resulting from the incomplete combustion of the kerosene, as we would naturally expect. I was glad to see Mr. Augustine's statement that he had tried the method and then torn down the engine and found no improvement, as it coincides with my own experience exactly. Carbon will come out after you put kerosene in, but it is simply the carbon in the kerosene, and in all probability there is really more carbon in the motor after this treatment than before, because some of the carbon formed by the incomplete combustion of the kerosene must be deposited on the cylinder walls and compression chamber. It is equivalent to running too rich a mixture through the motor, which is a very common source of carbon.

Now concerning the theory that the mixture of gummy oil and carbon is softened or loosened up and blown out. The usual practice is to pour in a small quantity, say a tablespoonful or so. At best all this could do would be to act on the head of the piston and possibly work around to the valve seats. It would not come in contact at all with the upper parts of the combustion spaces and certainly we could not expect it to loosen up the coating with which it does not come in contact.

Experience has shown that the running of a motor is sometimes better after using the

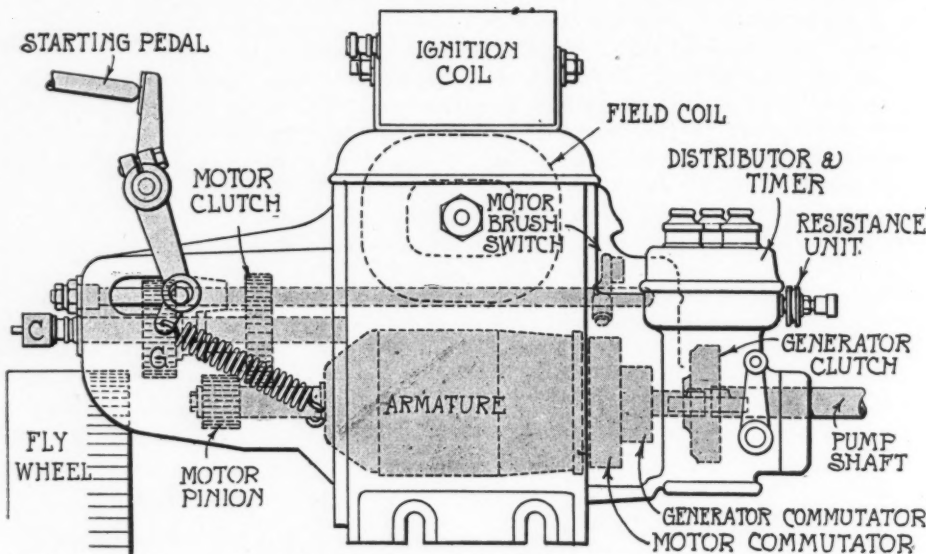


Fig. 1—Typical generator-starter construction, showing ignition distributor, generator and starter clutch

kerosene than before. This improvement is probably due, as Mr. Augustine suggests, to giving the valves a better seat and also possibly to some of the kerosene working down on the valve stems and springs and also to the rings, making all the parts work easier. The use of kerosene to wash out thickened or hardened oil from any of the working parts of a motor is sound both in theory and practice. I believe better results could be obtained by applying it as directly as possible by means of an oil can or squirt gun to the parts where it is needed rather than by introducing a quart or so through the carburetor, while the engine is running. As stated before, a part of the kerosene thus introduced is burnt up in the motor, making an excessively rich mixture and resulting of necessity in the deposit of additional carbon in the combustion spaces.

Good results may be obtained by the use of a small amount of kerosene in a motor once in a while, but we might just as well understand how this is accomplished and what really takes place as to think that we are getting rid of carbon, which is probably not the case, as the improvement is due to bettering the lubrication and possibly making the valves seat tighter.

I notice that in the issue of May 4 you inform a subscriber that the introduction of oxygen gas into the intake opening of the carburetor while the motor is running will not remove carbon, and that it will injure the intake manifold. Theoretically the presence of an excess of oxygen in the mixture ought to result in the combustion of the carbon at least to a limited degree, although the method

would certainly be less efficient than that now in use. I do not understand how it would injure the intake manifold. The method of generating oxygen in a tube to which the questioner referred was probably by heating potassium chlorate with manganese dioxide in a tube. Oxygen is generated in this way very easily, but the quantity is small.—M. H. Foster.

SHUNT AND SERIES GENERATORS

Principle Explained and Current in Modern System Traced

Delta, Colo.—Editor Motor Age—Explain how to connect a dash ammeter on a 1913 Buick 25 so it will show charge and discharge. I am able to connect it and get a discharge, but I am unable to get a charge reading on it.

2—Explain by diagram the principle of a generator and trace the current.

3—What is meant by shunt generator, series generator, field, and reverse windings?—Montford Gallup.

1—The standard equipment of the Buick 25 did not, to our knowledge, include an electrical system upon which an ammeter could be placed. If you have had a special starting and lighting system installed and can advise of the type and make Motor Age may be able to give you the information you require.

2—Figs. 1 and 4 show a common type of generator and the path of current in a characteristic starting, lighting and ignition system.

3—In Fig. 3 is shown a diagram of a shunt wound generator and of a series wound generator. In a generator of the former type the field magnet coils are placed in a shunt to the armature circuit, in other words through a resistance unit, so that only a portion of the current generated passes through the field magnet coils. A continuous balance of the current occurs, the current dividing at the

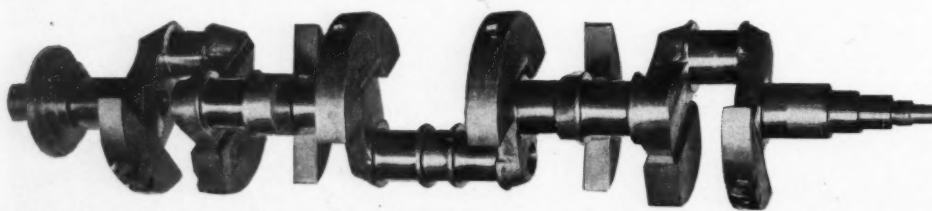


Fig. 2—From photograph of Hudson Super-Six crankshaft

brushes between the field and the external circuit in an inverse proportion to the resistance of these circuits.

In the series-wound generator the field winding and the external circuit are connected in series with the armature winding, in other words connected so that the entire armature current must pass through the field coils. Since in a series-wound generator the armature coils, the field, and the external circuit are in series, any increase in the resistance of the external circuit will decrease the electromotive force for the decrease in the magnetizing currents. A decrease in the resistance of the external circuit will, in a like manner, increase the electromotive force from the increase in the magnetizing current. The use of a regulator avoids these changes in the electromotive force.

Field means the area of magnetic force between the positive and negative poles of a magnet, or, as a concrete example, between the generator brushes.

Reverse winding is the process of winding a coil counter-clockwise, its purpose being to carry the current in the opposite direction from that set up in a clockwise wound coil.

BEST TYPE OF SHOCK ABSORBER Preference Based on Personal Opinion More Than Mechanical Attributes

Milwaukee, Wis.—Editor Motor Age—Which is the best type of shock absorber, the coil spring, pneumatic or Hartford friction type?

2—What is the highest speed of the new Marmon 34?

3—Give the gearshifting lever positions of the four-speed Hudson and Lozier.

4—Kindly give an illustration of the Hudson Super Six balanced crankshaft.

5—How can the camshaft and valves be altered to increase the speed of the car?

6—Kindly give the name of the concern from which the race drivers get their goggles.—A Reader.

1—There is such a variety of opinion as to the best type of shock absorber that Motor Age is not able to give a preference.

2—According to the factory there has been no accurate record made. However, a 60-mile-an-hour speedometer, which is the regular equipment, will not take care of the maximum. Therefore it is evident that the cars will travel considerably faster than 60 miles an hour.

3—To our knowledge Hudson never put out a four-speed gearset. The Lozier lever positions are illustrated in Fig. 5.

4—A photograph is shown in Fig. 2.

5—By increasing the speed at which the valves will seat. This is done by tapering off the metal stock of the cam from the point of maximum lift to the small diameter. It is an operation which requires great skill and mathematical figuring and should not be attempted by an owner.

6—Motor Age does not believe that the race drivers procure their goggles from any particular manufacturer. Goggle makers located in your vicinity are: Chicago Eyeshield Co., 128 S. Clinton St., Chicago; H. S. Cover, 6 Chippewa Ave.,

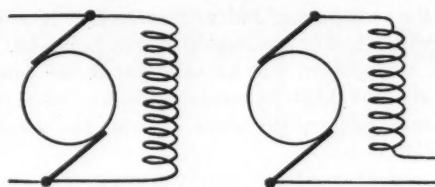


Fig. 3—Principles of shunt-wound and series-wound generators

South Bend, Ind.; Dimmer Goggle Co., Whiting, Ind.; F. A. Harding Co., 10 S. Wabash Ave., Chicago. We would suggest that you write to each of these for catalogs.

SLEEVE VALVES WILL NOT WARP Positive Valve Action Is Asset of Knight Type Motor

Rockport, Ky.—Editor Motor Age—Is the principle of all Knight type engines the same; that is, the method of lubrication, timing of the ports, location of spark plugs, the junk ring, and the shape of the combustion chamber?

2—Is there not more friction in a Knight type engine than in a poppet-valve engine of the same piston displacement?

3—Under excessive heat do the sleeves not expand and tend to bind?

4—We are told that the engine improves with use. After continued use do the sleeves not warp, twist or get out of shape; if not, where would the wear be apt to show up first? It could not possibly improve year after year.

5—The Stearns uses a counter-balanced crankshaft. Does this accomplish the same end that the one used on the Hudson does?

6—What is the engine speed of the Stearns Four at which maximum horsepower is developed? What is the maximum speed of one of the Stearns stock cars?

7—Will the Stearns be entered in stock racing this year?

8—What type of springs and tires are used on racing cars most?—Subscriber.

1—The principles are practically the same in each point you mention.

2—With a film of oil coating the sleeves, friction is almost an absent quantity in the Knight type of motor. Considering the power consumed in lifting the springs in a poppet valve motor and the power consumed in overcoming the friction in the sleeves of a Knight motor, the valve-actuating load on both motors is very nearly equal.

3—The thermal efficiency of a Knight-type motor is considered superior to that in

a poppet valve type due to the fact that a better shaped combustion chamber can be used and the areas of the valve openings are greater. For this reason, in a motor of correct design, the sleeves are exceptionally well cooled. Sufficient clearance is allowed to take care of what little expansion occurs in the sleeves.

4—Because of the fact that the sleeves remain comparatively cool and actuate between an oil film, wear on them is practically negligible. They improve with use inasmuch as they wear into a more perfect fit; in other words the high spots are ground away and the surfaces become glazed. Another advantage in favor of the sleeve valve is that its timing is permanent and unchangeable, and does not alter materially with wear. The valve construction lends itself to positive operation by eccentric mechanisms, which are an advantage over the non-positive cam mechanisms universally used to actuate poppet valves.

5—Yes, it is designed to accomplish the same purpose.

6—The maximum horsepower is developed at 2,400 revolutions per minute. The maximum speed of the Stearns-Knight four is listed by the factory at 55 miles an hour.

7—Motor Age has had no advice to that effect.

8—Semi-elliptic, front and rear, and cord tires.

SKIPPING MOTOR PROVES PUZZLE Improper Spacing of Spark Plug Caps May Be Trouble Maker

Cogswell, N. D.—Editor Motor Age—I have a 1909 model T Ford which misses when speeded up over 10 miles an hour when running on high speed, and when running idle it misses some, but not as bad. At first the front cylinders missed and I sent the engine to the Ford branch at Fargo and had them re-bored and fitted with new pistons and rings, but still it missed, first on one cylinder, then on another. I got a new Holley carburetor and timer and a new set of coils, which did it no good. The ignition wires are all good and it does not work any better on new dry cells than on the magneto. The timing is right and the valves are all new with new valve guides. The valves were all ground in good shape. When pulling hard on high it works fine on four

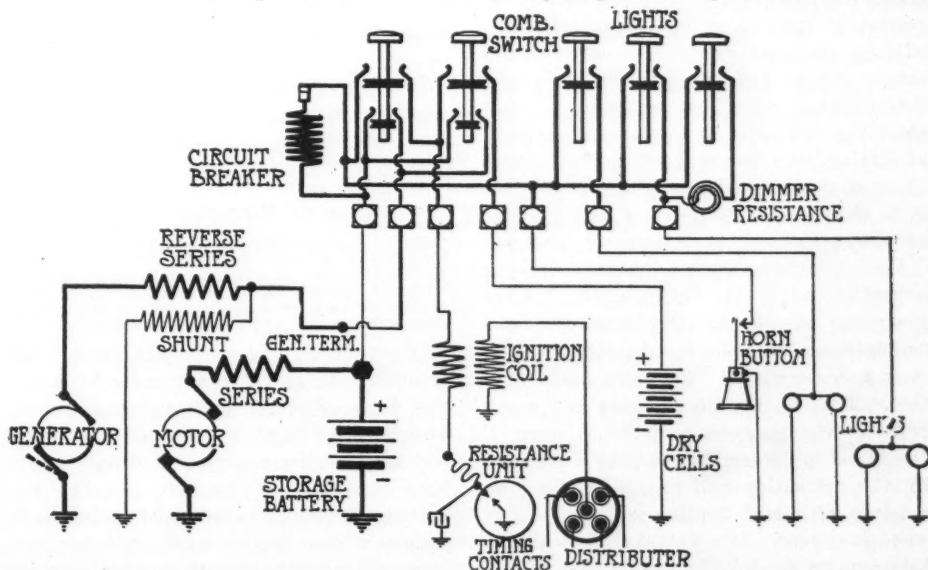


Fig. 4—Path of current in one Delco starting, lighting and ignition system

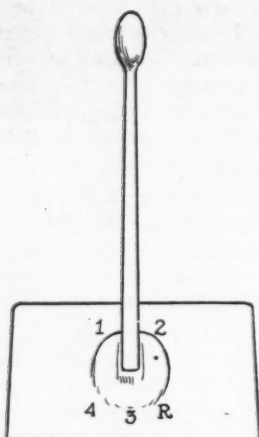


Fig. 5—Shifting positions of Lozier four speed gearset

cylinders and has lots of power. Can Motor Age advise something to remedy this trouble?—A Reader.

From your description the condition of your power plant seems to be about right. It would appear that there is about one place left to look for trouble and that is in the spark plugs. If these are not properly adjusted as regards the distance or gap between the points the trouble you describe could occur. Adjust your plugs with a uniform gap of about $\frac{3}{16}$ inch in each one and see if it helps matters.

MAGNETS BECOME DEMAGNETIZED In Assembling It Is Necessary That Like Poles Be in Contact

Gibbon, Neb.—Editor Motor Age—What demagnetizes the magnets on a Simms magneto? I have one with one magnet dead and the other one weak. The magnets have been recharged. They made a good spark on the bench and when put in the car ran about 5 minutes and stopped.

2—What is the cause of the magnets losing their strength so quickly?—R. P. Trivelpiece.

1—Are you positive that the trouble lies in a demagnetized magnet? It is often a difficult matter to ascertain whether magnets have lost much of their strength and need recharging. Possibly there is a short circuit in the coil windings. Magnet recharging, although a simple operation in itself, may be overdone by permitting the magnet to become oversaturated. There are two practical ways of determining when a magnet is full charged. The first is to test its capacity of lifting iron weights of approximately 10 or 15 pounds weight. Another method is to compare the lift with a new magnet of the same size and properly charged.

It is very probable that the proper assembly has not been made. After charging has been completed and the magnets are assembled onto the magneto it is necessary that like poles be in contact. That is, the north poles and south poles of the magnets must be in contact. It is best to determine the proper polarity by the attraction and repulsion effect on a piece of metal floating on a block of wood in water. If a compass is available this can be used. The north pole of the magnet will attract the opposite pole of

the compass. Poles incorrectly located will quickly demagnetize the magnets.

Magnetism will be soon lost if the poles are not kept connected. When magnets are disassembled place an iron bar across the ends.

2—The above explanations will undoubtedly suffice to answer this question.

Cylinder Angle in Eight Motor

Chicago—Editor Motor Age—In a recent issue Motor Age stated that eight-cylinder V engines have to be set at 90 degrees, and twelve-cylinder V engines at 60 degrees. I have before me an eight-cylinder V engine set at 77 degrees and 22 minutes and am desirous of securing an explanation as to the disadvantage of this construction.—G. Anton Slottelid.

An eight-cylinder V engine with the cylinder blocks set at 77 degrees and 22 minutes cannot be made to fire evenly. In an eight-cylinder motor you have half as many power impulses per revolution as there are cylinders, or four impulses. Inasmuch as a revolution means covering 360 degrees, it is evident that in an eight there must be a power impulse every 90 degrees, or one-fourth of a revolution. In the V-type engine the impulses alternate from one side to the other. Therefore, in an eight the crankshaft cannot travel any greater nor any less angle between impulses than 90 degrees, so that, in order for a piston to be in proper position to fire after a previous firing in a cylinder across the V, the angle between the cylinders has to be 90 degrees. With the angle at 77 degrees and 22 minutes there will be a variance of 12 degrees and 38 minutes in the firing of the cylinders.

Wants Opinions on Motor Types

Louisville, Ky.—Editor Motor Age—Would like a detailed account of the different engineers' opinions as to the advantages and disadvantages of the different types of motors over each other. That is, would like to know the advantage of the six-cylinder motor over the four-cylinder, and vice versa; the six over the eight, and vice versa; and the twelve over the eight, etc.

2—Also, would like to know the wear and tear on the different types of motors, and anything else Motor Age may be able to furnish along these lines.—Motor Sales Co.

1-2—To do either of these subjects justice more space would be consumed than is available in our columns. Accordingly we refer you to Vol. 1 of the Cyclopaedia of Automobile Engineering published by the American Technical Society of Chicago which treats the subject very thoroughly. This book should be found in any large public library.

Excessive Vibration in Motor

Farr, Colo.—Editor Motor Age—I have a 60-horsepower Thomas engine on a stripped car. The engine has excellent compression and all bearings seem tight. Kindly advise what causes an excessive amount of vibration when the engine is running.—H. H. Warner.

It would be impossible for Motor Age to direct you to the exact cause of vibration in your motor with such meager information at hand. A list of the things which will cause a motor to vibrate might help you out and we give you the following: improperly balanced crankshaft, pistons of varying weights, cylinders not firing with equal strength due to improper valve setting, imperfect ignition or carbon

deposits, loose wrist pins, loose main bearings, loose crankshaft bearings and insufficient support of the motor in the frame.

Raybestos in Place of Cork Inserts

St. Joseph, Mich.—Editor Motor Age—I have a 1914 six-cylinder Lozier which has a cork insert clutch. I have had considerable trouble from clutch slipping, necessitating the putting in of new corks about every 6 months. I am told that by taking out some of the disks which hold the corks and using Raybestos, which will not burn, the trouble could be remedied. Is this so? Or can Motor Age suggest any other remedy?—E. C. Maxwell.

If you mean the use of Raybestos disks in place of the cork insert disks, there is no reason why, if they are of the proper thickness, they should not give far better wear. This material has been used very successfully in disk clutches.

Ammeter Wiring on Hudson 40

Piercetown, Ind.—Editor Motor Age—Please print wiring diagram or an explanation of how to connect a 30-0-30, 6-volt ammeter to a 1914 6-40 Hudson equipped with Delco system.—R. C. McNamara.

Refer to Fig. 6. The brass connector A between terminals 1 and 2 must be cut in two. This can be accomplished very easily by means of a hack saw blade. Run a wire from No. 2 terminal to the positive terminal of the ammeter and another wire from the negative terminal of the ammeter to No. 1 terminal. No. 12 wire should be used. On the side marked charge the ammeter will indicate the amount of current charging the battery and on the discharge side it will indicate the amount of current used for the lights, ignition and for revolving the armature slowly previous to meshing the gears. It will not indicate the amount of current used for cranking. By inserting the ammeter at the fuse box connections and comparing this reading with the reading obtained at the generator terminal, a leak at the connection or in the conduit can be detected.

1916 Buick Specifications

Champion, Neb.—Editor Motor Age—What is the engine speed of the 1916 Buick light six, model D 45; also the gear ratio and bore and stroke?—R. C. Travis.

The maximum engine speed is 2,000 revolutions per minute. The gear ratios are: low, 12.7 to 1; intermediate, 6.15 to 1; high, 3.78 to 1. The bore and stroke dimensions are $3\frac{1}{4}$ inches by $4\frac{1}{2}$ inches.

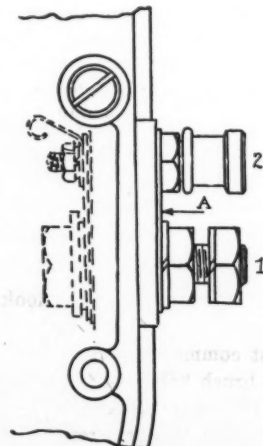


Fig. 6—Things to do to wire Hudson 40 for an ammeter



The Motor Car Repair Shop



Electric System Troubles and Their Remedies—Part II

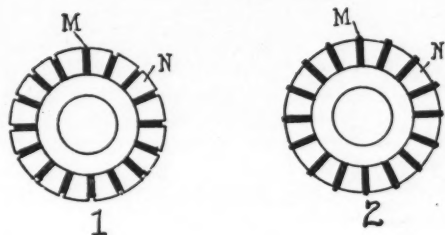
In the first installment we found that with the engine running, the lights might go out or get dim due to a number of causes, principally confining our attention to those resulting from short circuits in either the wiring or some of the instruments or lamps, from trouble in the battery or from defects in the generator itself.

Continuing our investigations, there are several other things besides short circuits that will bring about the lighting troubles with the engine operating. The other possible reasons are open circuits and troubles in the generator itself preventing it from generating the current it should.

Most usual of the generator troubles are weak field magnets, defects in the brushes or their holders, faults in the commutator, the armature winding, the circuit breaker or the governor that controls the generator output at various speeds. Most generators are made with electro-magnets that are wound, but in some cases the magnets are of the permanent variety such as used in magnetos. In this case if the magnets are weak it is due to their having become de-magnetized through some external influence, and the only thing to do is to have them re-magnetized—requiring the use of a magnet charging apparatus. But if the wound magnets of the more usual variety of generator are weak it is due either to the winding having been burned out, sometimes resulting from running the generator with the battery disconnected, or to the windings having become water soaked. Sometimes when the car is washed, water gets on the windings of the generator by accident, and this is a very serious thing, for if the windings get soaked, either grounding or short-circuiting is the direct result, necessitating the returning of the instrument to the maker for re-winding of the defective part, unless the repairman happens to know how to do it. It is most advisable, however, to assure the job being done right, and return the generator to the maker for repair. Running the generator with the battery disconnected builds up a very high voltage in the windings, eventually burning them out.

Brush Defects

Troubles in brushes and their holders are perhaps the first things to look for when the generator fails to work, these being the most common source of trouble. Sometimes a brush holder will become grounded due to improper insulation from the case. Examine each holder carefully and see that all insulating material between holder and casing is in good condition and that there



Showing a commutator at 1 with the mica segments M as they should be below the copper segments N, and at 2, the mica M too high, resulting in sparking.

is no possibility of trouble here before passing to other points. As the brushes wear down they give off carbon dust that might accumulate in the bottom of the generator case to such an extent that a short circuit between the brush holders would result. If there is any accumulation of this material, blow it out before it causes trouble.

Brushes Wear Down

Eventually the brushes wear down short and when they do they should be replaced. The spring tension pushing them down on to the commutator slackens as they wear down, and this must be adjusted, most generators being equipped with some means for varying this tension. You must be careful in doing this that you do not make the tension too great, for that would simply result in excessive brush wear and heating of the commutator. All that is necessary is a good sliding contact without undue pressure, for then you have an electrical contact without excessive bearing pressure. Occasionally a brush spring gets broken through one cause or another, and this must be replaced. The brushes should slide easily in their holders without sticking or binding. If they are too tight a fit they can be filed down somewhat until they are a good working fit, or if there is dirt or grease on the sides of the holder causing the sticking, this must be carefully wiped off. The end of the brush should bear evenly on the commutator across its whole end so that there will be an even contact. This bearing can sometimes be improved by a little careful filing.

Sparking might result from poor brush contact with the commutator, causing the holders to overheat and materially reducing the current output. Use the best brushes you can get—preferably those furnished by the maker of the electrical apparatus, for these will be of the material most suited to the particular make of instrument fitted to your car.

Possibly the trouble can be traced to

the circuit breaker, which, failing in its function of cutting the generator into the circuit at the right time, prevents the generator from delivering sufficient, if any, current to the battery. This might be due either to its being entirely out of order due to breakage of one of its parts; to improper adjustment; dirty, corroded or worn out contact points; or some fault in the insulation. The circuit breaker is usually a part with which the car owner is not advised to tamper, for it is more or less of a delicate mechanism that is hard to repair unless you know exactly how to do the work. Our advice would be to send it back to the factory if it proves to be the guilty member of the system.

Circuit breaker damage also may result from running the generator with battery disconnected, giving it an overload that brings on one of the faults previously mentioned. If for any reason you have had occasion to remove the wires from the generator be sure that they were put back on the right terminals. If they happen to have been reversed, this could easily result in the circuit breaker points sticking. Then the damage would go further, for there would be a dead short circuit on the battery, discharging it very soon. Such a state of affairs would be indicated by the ammeter swinging to extreme discharge when the engine is started.

Generator Failure

Generator failure might also be traced to a burned out or grounded armature winding, either of which would necessitate expert repair, preferably at the factory. If the winding gets grounded, the insulation is defective somewhere, but this is a remote trouble that would very likely be caused by defective construction in the first place. Should the armature get wet, it might burn out, just as it would if the circuit breaker points got stuck together, causing a reverse current to flow from the battery. Or the current controlling mechanism might get out of adjustment. These are things, however, to determine upon after everything else has been found to be in good shape.

The commutator is another part of the generator in which there are possibilities of preventing the generator from operating. Should a tiny piece of metal bridge across the insulating strips between the segments, it could bring about a short circuit. Excessive brush sparking will blacken or make the surface of the commutator rough. The brush troubles that have a hand in this have already

(Concluded on page 45)

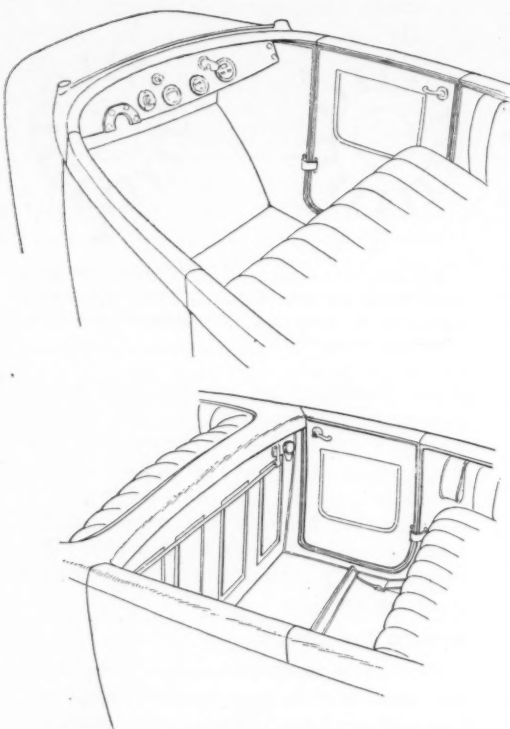
Bour-Davis Enters Field of Luxury Cars

Newcomer at \$1250 Has Excellent Coach Work and Many Unusual Refinements—Two Body Types of Striking Beauty and in Optional Colors

DESIGNED to meet the requirements of that class of buyers which demands luxury of appointments, finish and detail in a car, along with distinctiveness and individuality, in addition to efficient mechanical construction, the Bour-Davis, which is the product of the Bour-Davis Motor Car Co., one of Detroit's newcomers within the past year, is now formally placed before the public. The thought of the builder, in producing the car, was to fill the gap in the price class for the luxury type of car between the rather low-priced type and the high-priced vehicle. The figure has been set at \$1,250 for the touring-car model, and \$1,500 for the enclosed type, the only other form of body offered on the chassis.

Unusual Equipment

How well the designers have carried out this idea can be judged from the photographs and sketches, and besides possessing some decidedly new and pleasing curves, the body is quite lavishly equipped for a machine at this figure. At the same time, it is a comparatively large and roomy vehicle, made up of standard parts from the plants of well-known parts and accessory manufacturers. The motor is a Continental; the gearset is produced by the Detroit Gear & Machine Co.; Borg & Beck make the clutch; Remy supplies the ignition; Stromberg the carbureter; Ward-Leonard builds the lighting and starting system, and so on. Some of the rather unusual equipment features are a roomy luggage trunk at the rear, Motometer for determining the water temperature, rear-vision mirror, windshield cleaner, in addition to the generally-accepted requisites of the car of today.



Above, sketch showing front body curves and panel along top; below, paneled back of front seat and body line at seat top

To still further carry out the distinctiveness idea, no fixed standard color is supplied. A series of special color combinations are optional, so that each purchaser can have the particular shades that best suit him.

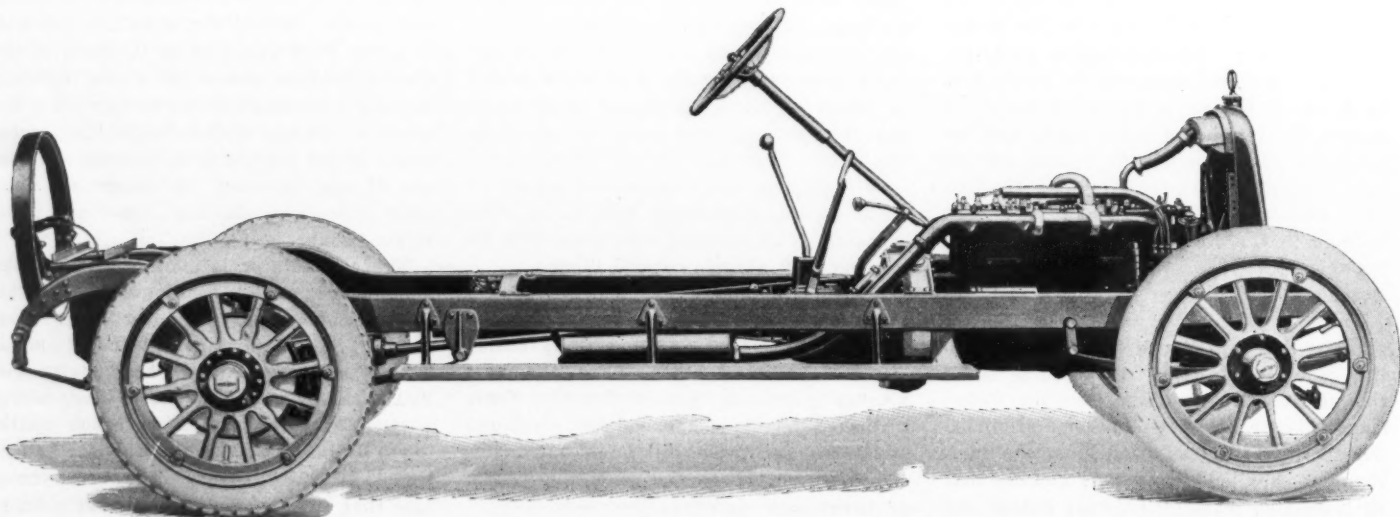
Getting down to the mechanical features of the car, it will be found that there are no radical things, practically standard design being adhered to throughout the chassis. The motor incorporates the gear set in unit and is a $3\frac{1}{4}$ by $4\frac{1}{2}$ standard Con-

tinental type of six, which has a piston displacement of 224 cu. in., and is of the form in which the upper part of the crankcase is in unit with the block of cylinders, and the head is detachable. This design of cylinders and crankcase makes for a rigid construction and insures alignment of the bearings and cylinders, while the removable head is a great boon to the owner for it allows access to the combustion chambers etc.

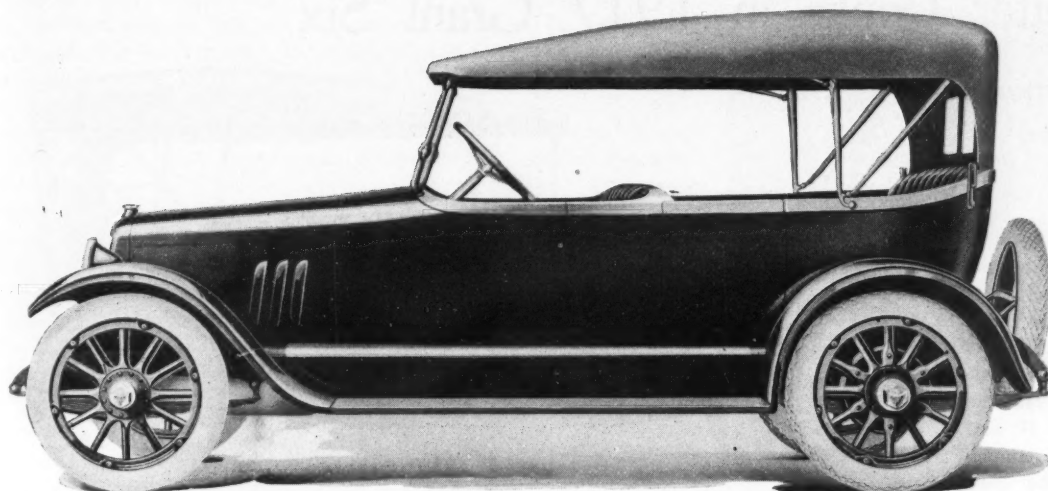
Motor Details

Crank shaft and camshaft are well mounted to insure minimum of vibration, and each has three bearings. The crankshaft bearings are bronze-backed and babbitt-lined, and their ample proportions are indicated by the dimensions: $2\frac{3}{8}$ by $2\frac{1}{2}$ inches, $2\frac{1}{4}$ by $2\frac{7}{8}$ inches, and $2\frac{3}{8}$ by $2\frac{1}{8}$ inches, these being the front, center and rear, respectively, and the first figure in each case representing the diameter. One of the essential features of efficient motor operation is a substantial camshaft that cannot be distorted, and in this motor the point has been well considered for the dimensions of the camshaft bearings are quite large. The diameters are $1\frac{7}{8}$, $1\frac{1}{8}$ and $1\frac{1}{8}$, and the lengths $2\frac{1}{2}$, $2\frac{1}{2}$ and $2\frac{1}{8}$ inches, front to rear, respectively. The cams have wide faces of $\frac{3}{4}$ inch, and the shaft is driven by helical gears.

To promote smooth running with a minimum of vibration, the connecting-rod and piston assemblies are all weighed and the six that enter into the construction of any one engine are of the same weight. The rods and pistons present no differences over standard practice for these parts. The rod runs in bushings at both ends, that at the piston end being of bronze and at



Side view of Bour-Davis six-cylinder chassis having 118-inch wheelbase



Bour-Davis touring model has exceedingly trim lines

the shaft end of die-cast babbitt material.

A cam-operated oil pump feeds the lubricant to the bearings and to troughs, from which it is splashed by the rod ends to the various other bearing surfaces within the engine. This is the conventional force-feed and splash combination with which Continental has been very successful. The oil capacity of the pressed-steel oil pan that forms the bottom of the motor is 5 quarts, the amount held at any time being indicated by a dial on the side of the pan, while the oil pressure is told by a gauge on the instrument board.

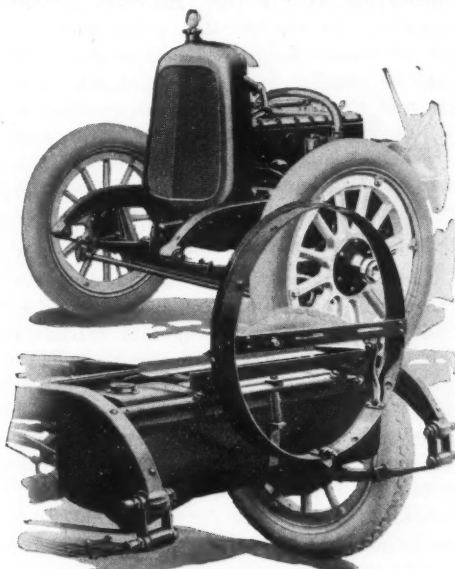
Cooling Features

On the right side of the engine and forward is the centrifugal water pump, which is driven from the timing gears by a shaft. Between this unit and the cylinder block and the radiator the piping is therefore short with obvious advantage. The water outlet is formed in the head casting and is also forward so that there is only a short pipe connection to the radiator. There is an efficient belt-driven fan at the front, the tension in the belt being adjustable by means of the bracket that holds the fan.

Ignition, starting and lighting units are separate. That is, a two-unit Ward-Leonard equipment is provided for furnishing the lights and starting, while a Remy high-tension coil and distributor are used for ignition. The starting motor drives through teeth in the flywheel, meshing and demeshing of the starter pinion and the flywheel teeth being accomplished by the Bendix automatic device, now well known. It is only necessary to press the starting button, when the revolving of the motor armature automatically throws the pinion into mesh with the gear, and the operation is reversed when the engine starts under its own power. The generator is driven by the front gears, and connects to a 6-volt, 80-ampere-hour storage battery.

In the gasoline system, there is combined a Stromberg horizontal-outlet carburetor with a Stewart vacuum feed tank mounted on the front of the dash. The gasoline supply tank is carried at the rear of the chas-

sis, and a very commendable feature of its mounting is the three-point suspension employed so that it does not have to take the strains resulting from any frame weav-



Above, view of Bour-Davis radiator; below, combined tank mounting, trunk rack and tire carrier

ing, as would be the case if it were rigidly mounted. Besides this, the rear center mounting is cushioned by a coil spring, hence precaution has been taken against

any tank trouble through leakage or damage.

Back of the engines, the drive passes through a 10-inch disk clutch which is provided with an easy adjustment for uniformity of action, and which in service seems very free from slippage and jerking. Compactness is specially noticeable in the gearset, which forms a unit with the motor. Transmission gears and shaft-front end of the car is castored fashion, thus counteracting the road shocks. The rear ends of the frame rails are bent down to hold the rear ends of the springs, which are long—52 inches—and underslung from the axle, thus giving the car a low mounting.

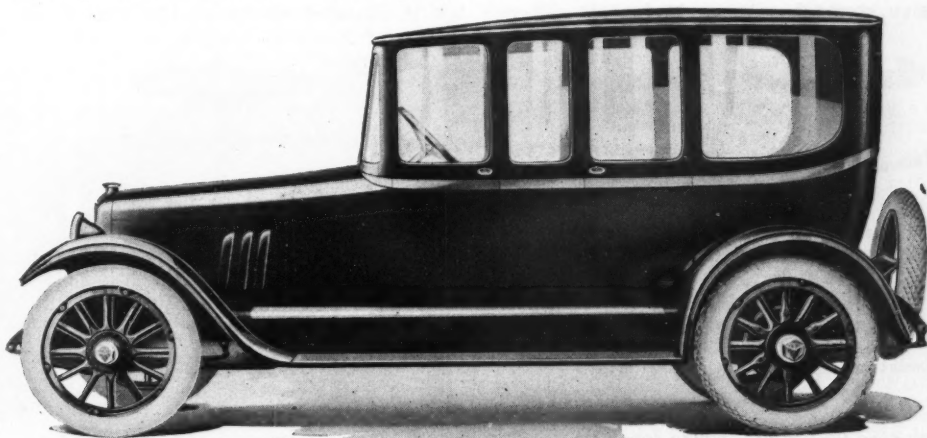
To insure proper strength, the main leaves of these springs are constructed of a special chrome-vanadium steel.

Attention should especially be called to the excellent coach work and general design of the body. Following latest body fashions, it is a streamline adaptation with high, sloping bonnet and slightly rising cowl-board, accentuated by the second cowl at the driver's back. The trim lines are cleverly emphasized by a smooth raised panel of a second color, this panel being 1½ inch high.

The wheelbase is 118 inches and the space is so utilized that there is plenty of leg room. The front seat is 14 inches high, 16½ inches deep and 42 inches wide, and the rear 14½ by 18 by 47 inches. The angle that has been given the seats and the shaping is such that they are remarkably comfortable.

Panelling a Feature

The instrument board is finished in walnut, and the back of the front seat is very attractively paneled, a feature that adds greatly to the general appearance. In connection with the equipment, one very nice refinement is the combination dash and trouble lamp this being normally a dash illuminator, but pulling out with 18 feet of cord for trouble use.



The Bour-Davis enclosed car is of meritorious design

Better Looks in 1917 Grant Six

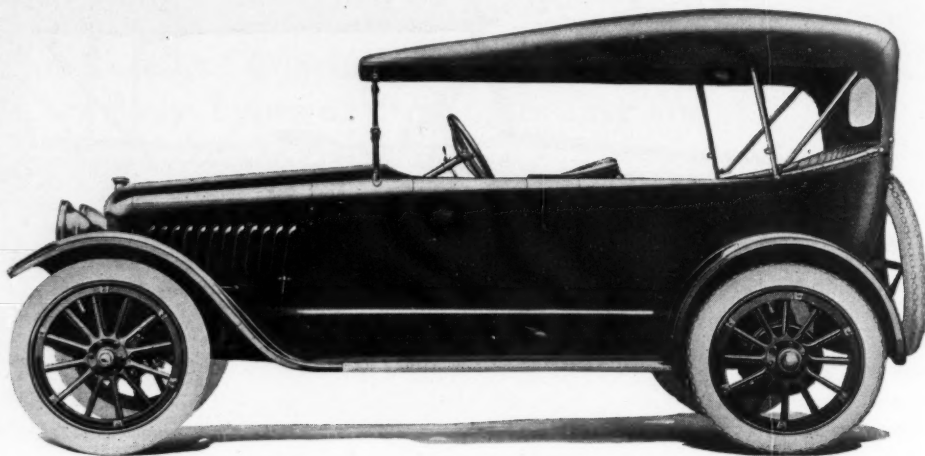
Body, Electric Equipment, Gas Feed and Carbureter Changed

AMONG the first to make announcement of light sixes for the coming season is the Grant Motor Car Corp., now located at Findlay, O., but which is shortly to move to Cleveland. This concern has lifted the veil from what is undoubtedly the best-looking vehicle yet produced under the Grant name. It is known as model K, and is to represent the company in the moderate-priced six-cylinder field for the 1917 selling year.

Although the most noticeable change over the previous Grant six is in the body lines, there are a number of mechanical improvements that help to make it a better car. A Wagner two-unit starting and lighting system replaces the single-unit system, and Remy ignition is fitted in place of that used in 1916 production. Stromberg carburetion is also given a place along with a change in the fuel system from the cowl tank to a reservoir at the rear from which the gasoline is drawn by Stewart vacuum feed. Larger brakes, minor changes in the instrument board arrangement, a larger steering wheel and a standard design of I-beam front axle are also changes of note.

The matter of silence has also been carefully considered, and the Grant engineering department has gone over the entire chassis with the idea of making it quieter than its predecessor. This greater silence of operation has been brought about in the power plant, the running gear and in the springs.

Practically no change has been made in the general design of the 3 by 4¼ overhead valve, block-cast engine with the exception of those minor differences due to the fitting of a separate starting motor and separate generator, and the use of a different carbureter. The cover plate that previously was fitted to the top of the cylinder block to house the rockers and valve stems has been eliminated. There



Striking lines in new Grant touring body

is a good reason for this. It was found that in the hands of the average owner, the valve parts did not get the proper lubrication due to the fact that it was necessary to remove this cover plate to get at them. So in order to make it as easy as possible to take care of the rockers and their bearings it was decided to do away with the cover, and large and convenient oil cups are provided to take care of the proper lubrication of the rocker shafts, of which there are two.

New Stromberg Carbureter

The new Stromberg carbureter connects directly to the cylinder head, with the distribution of gas to the several cylinders performed through cored passages within the casting itself. In the previous design, there were two inlet connections in the head unit, and a double-branch manifold connected externally from these to the carbureter. Now there is no external manifold whatever so far as the inlet of gas is concerned, and the new attachment permits of the carbureter being placed higher on the engine so that it is more readily accessible to say nothing of being conducive to better carburetion because the gas has less distance to travel. This higher mounting is made possible due to the institution of the vacuum feed system.

Although the make of ignition apparatus is changed to Remy, the method of

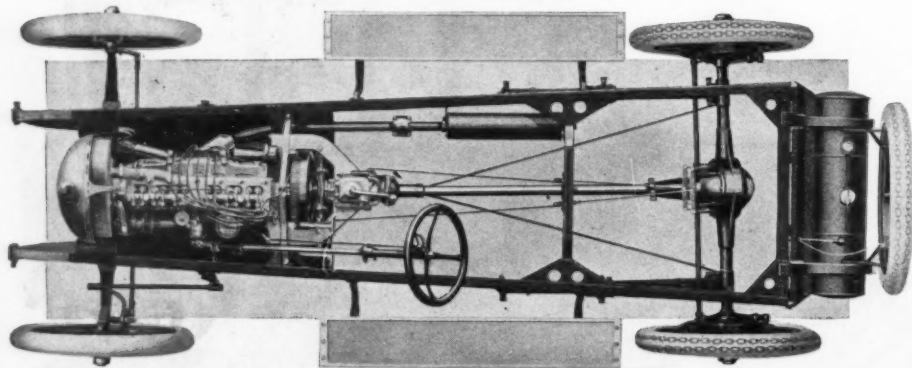
drive and the location of the distributor is not changed. Driven off the end of the camshaft, the vertical distributor shaft occupies the left rear side, and the distributor is plenty high to make it easy to reach, at the same time affording ample room over the top of the valve rockers to allow the wires to be run without interference to the plugs on the right side of the head, a supporting bracket being fitted which carries each ignition lead well out of the way of the valve parts.

The starter motor is a separate unit and is mounted at the right rear side of the engine. The driving connection is made through the Bendix centrifugal-action device to teeth cut in the rim of the flywheel. The generator occupies the opposite side from where it was located on the 1916 engine, it being mounted so as to be driven by an extension of the fan driving shaft, a leather universal coupling allowing for any slight variation in alignment and making a noiseless connection.

Motor Review

Reviewing some of the salient features of the motor, for the benefit of those who are not familiar with the Grant powerplant construction, it should be mentioned that the unit is suspended in the frame at three points, the front end resting freely on the front cross member, and the rear being hung from a forged cross member just back of the cylinder block. The main cylinder casting and the upper part of the crankcase are one piece, this making a rigid and compact unit that carries the crankshaft and insures alignment of the cylinders and the shaft. The head casting, which carries the valves and their operating mechanism, is bolted to the main unit, and it is therefore a simple process to reach the cylinder wall and the pistons when occasion demands.

Internally, standard practice has dictated the design throughout. There are three bearings for the crankshaft, these being of the ample diameter of 1½ inch, with the lengths 2½, 2 and 3 inches, from



Plan view illustrating sloping frame construction and strong gusset plates at the cross members. Simplicity is evident in the whole assembly

front to rear, respectively. Pistons are of cast iron and as light as is consistent, each carrying three rings. Three bearings are also provided in the camshaft and the cams are so shaped that quiet action is one of the first considerations. One nice feature of the valve assembly is the provision for removal of the tappets and their bushings from the top of the crankcase outside. The tappet assembly for three cylinders is made a unit so far as the mounting is concerned, and by the removal of six bolts this can be lifted out bodily. Timing gears are helically cut, the center gear being steel and the others cast iron so that they run silently together.

Plunger Oil Pump

Driven off the rear end of the camshaft is a plunger oil pump that draws the lubricant from the motor base after it has been strained, and delivers it through a dash sight feed and thence to the front gear case and to the rear of the engine. From this point it overflows into the successive connecting-rod troughs and eventually runs back into the reservoir at the bottom. An oil indicator, which is neatly formed as a part of the oil pump case, tells the quantity in the reservoir. This is on the left side.

Thermo-syphon cooling is still advantageously adhered to in this car, the radiator being assisted by a pressed-steel six-bladed fan, there being the customary adjustment at the fan mounting for taking up any slack that may develop in the belt leather. Grant is still using the characteristic rounded-front radiator, which is of a special tubular form.

The method of attaching the gearset to the rear of the motor by means of two drop-forged arms has not been changed. This mounting leaves the flywheel open, and is a factor for reducing weight to the minimum. The gear assembly is a compact unit having the usual three speeds ahead. To give it ruggedness, and to make the unit as compact as possible, the countershaft gears are cut integral with their shaft, the forging being blanked out as a single piece. The gears are $\frac{5}{8}$ -inch face of the stub-tooth shape, and in mounting their shafts a double-row ball bearing carries the front end of the mainshaft, a single ball bearing the rear end.

The torsion tube enclosing the propel-

ler shaft is light and strong to carry the drive and torque and presents a most compact appearance with the rear end swaged out to meet the axle housing. The axle is floating, with means for gear adjustment on removal of the rear inspection plate, this applying to the driving pinion. A gear ratio of $4\frac{1}{2}$ to 1 on high is used.

Although the diameter of the brakes has been considerably enlarged from $10\frac{1}{2}$ to 12 inches, there is no other change of importance in the braking system. The equalizer bars are carried at the rear axle on the brake operating rods that are attached forward of the axle tubes. By bringing the equalizers all the way back, side brake operating rods are eliminated, only one control rod from each brake control running back from the supporting cross member.

New Front Axle

In connection with the running gear, the previously used front axle, which, though it was of I-beam section, was fitted with some specially-designed steering knuckle mountings and features, is replaced by a standard form with strong and stout steering connections throughout. Nothing has been changed in the rear cantilever spring suspension. These members are 38 inches long by 2 inches wide and give free action due to the trunnioning of the center directly under the frame member and the shackling of the front end, with flexible mountings to the axle tube as well. The springs get none of the driving strain, which allows them to have plenty of freedom to take care of the spring function only, and because they are attached under the frame, the latter does not receive any of the twisting stresses. Under full load the springs are practically horizontal, and the limit of their action is $\frac{1}{8}$ inch, arc, tending to give good riding qualities, sideways being provided against by wrapping the second leaf around the master leaf.

In attaching the gasoline tank to the rear, the same supports are used to carry

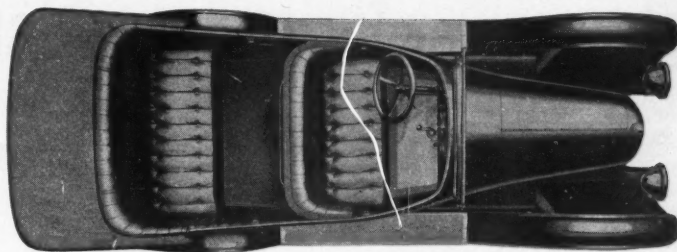


Fig. 3—Top view of Grant touring car, which gives some idea of sloping body lines

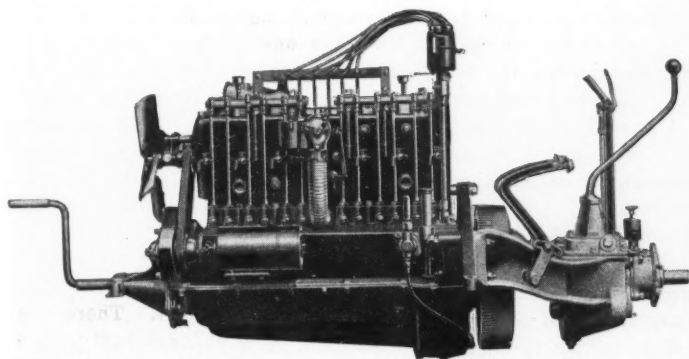
the spare tire on the touring model. The extra tire on the roadster is housed in the rear desk of the roadster as already explained. No change has been made in the 112-inch wheelbase, nor in the tire size, which is 32 by $3\frac{1}{2}$, with non-skids on the rear.

Besides the roadster and touring body types, Grant is offering a cabriolet model as well. This has much the same smooth curves as the roadster. The prices are \$825 for the two open models and \$1,050 for the cabriolet.

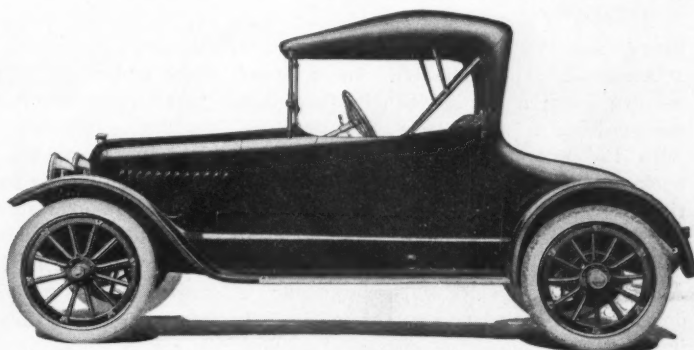
NEED NOT FILE DRIVERS' NAMES

Milwaukee, Wis., June 12—Milwaukee motor car dealers have received an opinion from the attorney general of Wisconsin that they are not amenable to the provision in the state motor code which requires manufacturers to file names of drivers and their distinguishing numbers in the office of the city clerk, town or village clerk in which they are established.

The district attorney of Milwaukee county was advised by the sheriff that his deputies had great difficulty in identifying drivers with so-called "star numbers," which are issued to manufacturers and dealers to distinguish them from private owners. The state law says that every individual operating any motor car, motorcycle or other motor vehicle belonging to any manufacturer shall have assigned to him by said manufacturer a distinguishing number or letter, which, together with the name of the person to whom it is assigned, shall be registered in the office of the clerk of the town, city or village in which the establishment of such manufacturer is situated. The purpose of the law is to regulate the testing of cars on public streets and highways.



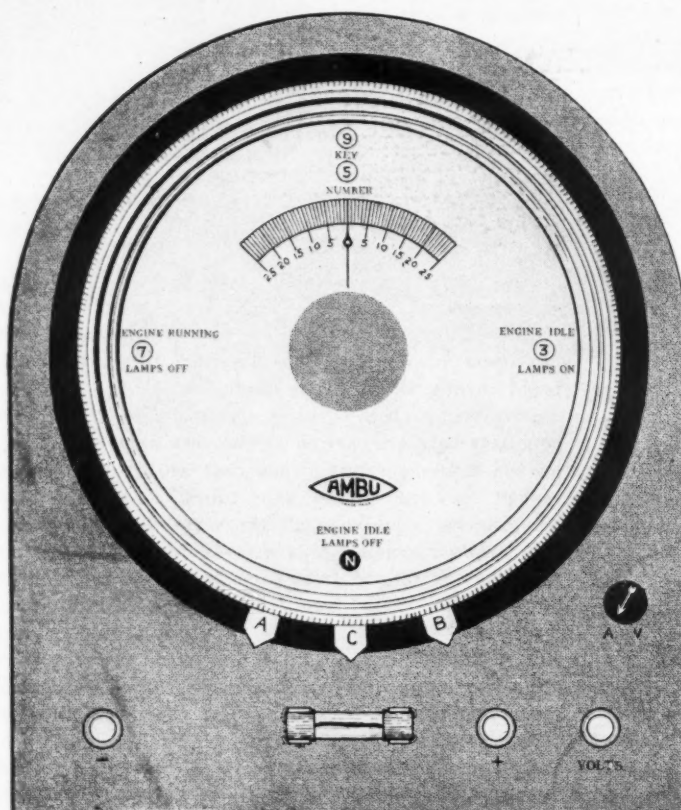
Left side of 1917 Grant motor. The most important change over last year's motor is the non-enclosure of the rockers



New Grant roadster with its graceful body. A liberal luggage carrying space is provided in the rear

An Automatic Trouble Shooter for Electrical Systems

Quick Test Aid for
the Use of the
Gasoline Car
Repairman



Combined Am-
meter and Volt-
meter in the
Equipment

The special ammeter-voltmeter that features the Ambu system

AS a result of the rapid advancement in the design and construction of the electrical systems by the many different companies in the field, the repairman is confronted with quite a serious problem inasmuch as he may be called upon to adjust, repair, test or locate a case of trouble in any one of the different models of these numerous systems. It is quite apparent that it would be humanly impossible for the general repairman to ever hope to be able to intelligently handle each and every case of trouble as it comes into the shop, regardless of make or model.

The American Bureau of Engineering, Inc., Chicago, appreciated the seriousness of the repairman's problem some time ago and has developed a very ingenious trouble shooting outfit designed to locate electrical troubles automatically. This outfit consists of a specially constructed combined ammeter and voltmeter of the D'Arsonval type mounted on a neat wooden base; a single-blade knife switch mounted on a slate base and provided with the necessary connecting leads; a book containing all the necessary instructions for setting the dials of the instrument so as to test the electrical equipment of any American made car carrying American made electrical equipment; a dozen books, called master charts, dealing in detail with the various makes of electrical equipment, and several hundred wiring diagrams covering practically every

American made car that has been equipped with a standard starting and lighting system.

The specially constructed combined ammeter and voltmeter has been given a special name, "Ambu," by the American Bureau of Engineering as in reality it is not an ammeter and voltmeter alone, but embodies additional features not found in either of the above instruments. An internal switch within the instrument is operated by turning a small black knob on the base of the instrument so that the arrow on the knob points to the letter V when it is desired to measure pressure or volts and to A when it is desired to measure current or amperes. There are three binding posts mounted on the wooden base of the instrument. Two of these posts are marked — and + respectively and are used in when current measurements are to be made. A third binding post marked "volts" is mounted in one corner of the base and when a pressure measurement is to be made this binding post and the one marked — are used. A small inclosed fuse is mounted on the base and serves as a protection to the instrument from damage due to an excessive current.

Principles of Construction

The instrument is provided with three movable dials that are so constructed and mounted that they may be moved, by means of three handles extending through the lower side of the case, about the moving system of the instrument which is

mounted in the center of the circular case. The topmost dial is provided with a zero center scale and it reads to 25 amperes in either direction or 25 volts in either direction when the proper connections are made to the instrument and the position of the scale adjusted so that its zero point is directly under the end of the needle when there is no current through the instrument.

This main dial or face plate, as it might be called, is controlled by the handle at the lower edge of the instrument marked C. There are two small openings in the main dial near its outer edge and directly above the center of the dial. These openings are called "key" openings and their purpose will be explained later. There are three other small openings in the main dial near its outer edge, one to the right of the center, one to the left of the center and one directly below the center. The opening at the bottom is marked "engine idle, lamps off"; the opening to the right is marked "engine idle, lamps on," and the opening to the left is marked "engine running, lamps off." The handle at the lower edge of the instrument marked A control a movable dial whose key numbers show through the upper key opening at the top of the main dial, and another handle marked B controls a movable dial whose key numbers show through the lower key opening at the top of the main dial.

The operation of the instrument can,

perhaps, be best explained by going through the main details of an actual test. The first thing to do is to open up the battery box, disconnect the wire from the positive or negative terminal of the battery and then connect the single-pole switch between the terminal of the battery and the end of the wire just removed by connecting the ends of the heavy leads from the switch to the battery terminal and the end of the wire, respectively, by means of the special connectors provided with the instrument. Care should be exercised in making these connections to observe positive and negative relations. The two small wires should be connected from the terminals of the single-pole switch to the binding posts on the instrument marked — and + respectively. The completed connections of the instrument are shown in Fig. 1.

Finding the Trouble

Next determine the make and model of the equipment under test and by means of the index in the reference book find out where this particular equipment is treated in detail. Turning to the page on which this equipment is listed, find the proper key numbers. You then move the handles A and B until the proper key numbers appear through the opening in the top of the main dial. When the above adjustment is made the main dial must be in such a position that the zero point on its scale is directly under the needle and no current through the instrument.

After the above adjustments have been made, the single-pole switch is opened and all of the current the battery may be supplying allowed to pass through the instrument, except when the starting motor is operated, when this switch should be closed. The handle C is then moved until the zero line or arrow on the main scale is brought directly under the end of the pointer.

If everything is normal under these conditions, the letter N will appear through the opening marked "engine idle lamps off." When the letter N does not appear there will be a code number appearing which indicates that you should follow the directions given in the master chart bearing that number and for the particular equipment tested.

The second test is made by turning all of the lights on and again adjusting the position of the arrow on the main scale so that it is directly under the end of the pointer. If everything is normal under these conditions the letter N will appear through the opening marked "engine idle lamps on." If a number should appear instead of the letter N then you should proceed according to the instructions given in the master chart bearing that number and for the equipment being tested.

The third test is made by running the engine at a speed corresponding to approximately 15 miles an hour and if everything is normal for the condition of operation

the letter N will appear through the opening marked "engine running, lamps off" when the arrow is directly beneath the pointer. If a number appears instead of the letter N, the instructions given in the proper master chart should be followed.

The various charts give all of the causes for the different cases of trouble which may result in the given indication of the instrument.

The principle involved in the operation of the instrument is that every make of car, when it is operating properly, has a definite lamp current and also a definite charging rate and hence the deflection of the pointer should correspond to this current in each case, and the letters N are placed so that they will be seen through the proper opening at the same time. If the current is too great or not enough certain numbers will appear instead of the letter N and these numbers, as stated above, refer to a certain group of possible causes of the trouble when the chart bearing that number and for the equipment being tested is used.

The instrument, books, wiring diagrams, etc., are all neatly packed in a metal box provided with lock and keys.

ORGANIZE TO PROTECT JITNEYS

Milwaukee, Wis., June 12—The Milwaukee jitney bus owners' society, known as the Automobile Mutual Liability Co., Limited, has taken steps to protect the jitney business and the public as well by appointing one of its members as "traffic officer," whose duty it is to see that all traffic rules set by the police are enforced. It also is the duty of the officer to see that the best

service and proper treatment are given to patrons by all jitneers, and that no one commits infraction of the rules. At this time there are 260 jitney busses in operation in Milwaukee, and the business is strictly regulated by the Railroad Commission of Wisconsin.

Electric System Troubles and Their Remedies Part II

(Concluded from page 39)

been touched upon, and if everything is in ship-shape so far as the brushes themselves are concerned, the trouble might be in the mica insulating strips interposed between the copper segments of the commutator. If these are high so that they extend above the surface of the copper pieces, brush sparking results. Wear is responsible for this condition, the copper being softer. Using a small file, these mica pieces should be filed down until they are slightly below the copper strips, it being necessary to take out the armature from the generator case to do such work. Having lowered them enough, make sure that no small particles of copper bridge the gaps to short the pieces, as pointed out. If the surface of the commutator is rough, smooth it down with a strip of fine sandpaper that will be wide enough to go all the way across the commutator, insuring even smoothing. Do this as the armature is rotated. Do not use emery paper for this, as it has too abrasive an action for the soft copper segments to withstand.



How the Amdu is connected for testing



The Accessory Corner

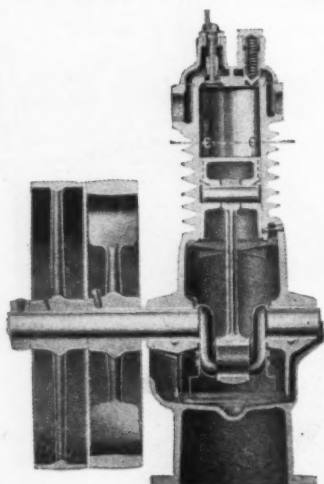


All Steel Truck Bodies

SOMETHING novel in the line of bodies for motor trucks is being offered by the Stover Steel Tank Co., Freeport, Ill., in its all steel non-destructible truck equipment. The factory of the company is equipped with the most up-to-date machinery and puts itself in a position to make up any special type of body which its customers may specify. The all-steel bodies weigh no more than the better grades of oak and hickory wood bodies. There are absolutely no bolts, screws, nails or obstructions of any kind to hinder the sliding on and off of boxes, sacks, etc. The steel used in forming the platform of the stake bodies varies in thickness according to the kind of goods to be hauled and the rated capacity of the truck for which the body is intended. The lightest metal used to form the platform is $\frac{1}{4}$ -inch steel and for larger trucks this thickness varies from $\frac{1}{8}$ to $\frac{3}{8}$ inch, according to the rated capacity of the truck.

Garage Air Compressors

Stationary and portable air compressors of all kinds are being manufactured for garage use by the Curtis Pneumatic Machinery Co., St. Louis, Mo. Distinctive features in the Curtis compressors are: Controlled splash oiling system, knife blade oil throwers and distributing ribs which abundantly oil all parts with no excess in the cylinder nor waste of oil. One-half pint of oil will keep the motor lubricated for 100 hours of continuous running. The cylinders are air cooled and the fan flywheel, on the same shaft with the driving pulley, assists in cooling. The valves are of light weight and large area



Cross section of one of the Curtis air-compressors



Stover all-steel stake body

and are inclosed in a safety cage which prevents possibility of broken valves dropping into the cylinder. Bearings are die-cast, adjustable and interchangeable. The crankshaft as well as the connecting rod is drop forged. The cylinder head may be removed without breaking pipe connections or bending the pipe. Various compressors range in size from a bore and stroke of $1\frac{1}{8}$ by 2 inches to $4\frac{1}{2}$ by $4\frac{1}{2}$ inches. The different styles include stationary electrically driven compressors with tanks, portable electrically driven compressors and bench machines, to be driven from lineshafting. Prices range from \$9 to \$60.

Mechanical Starter for Fords

The Peoria Specialty Co., Peoria, Ill., has introduced a chain and drum starter for use in the Ford cars which is of novel design. The device is operated by a pedal placed just at the left of the low and high gear pedal on the footboard. The ratchet construction eliminates danger of back fire as will be noted by an examination of the illustration herewith. The device is attached to the crankshaft in front of the radiator.

Permalite Batteries

The Union Motor Device Co., Indianapolis, Ind., has entered the storage battery field with a six-volt 250 ampere momentary discharge rate battery. The new permalite is designed to fit about 80 per cent of the electric started cars that have been on the market for 12 months or more. The company's dealers in the different localities are required to do the recharging for exchange on one of the special charging sets which is leased from the factory. In this way they have no freight charges or a large number of batteries in stock such as is necessary in

gas tank exchange. The system guarantees a battery in perfect condition on each exchange and if one should fail to show a full charge, it is replaced to the agent. The consumer therefore has no further expense other than the nominal exchange fee.

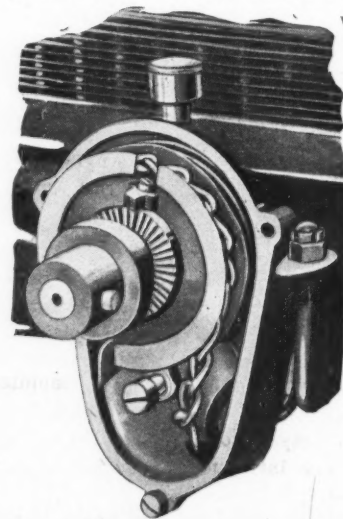
Tire Saving Jacks

The Brisk blast tire saver jack is designed especially for use in garages to lift the tires from the floor when the car is not in use. It is simple, easily adjusted and compact, having a malleable lift bar and lever, gray iron stand with $2\frac{3}{4}$ by $4\frac{1}{4}$ inch base and can be operated per set of four is \$3. The Brisk Blast Mfg. Co. St. Louis, Mo., are the manufacturers.

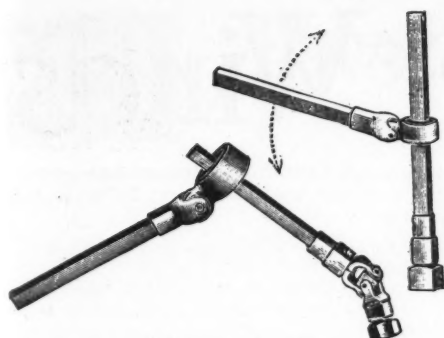
This company also puts out the Brisk blast double action steel tire pump and the Sure Blow tire pump. Both have cylinders made of seamless steel tubing which is polished, japanned and baked. Price of the former, which is a double action pump, is \$2.50 and the single action Sure Blow sells for \$2.

Removable Handle Socket Wrench

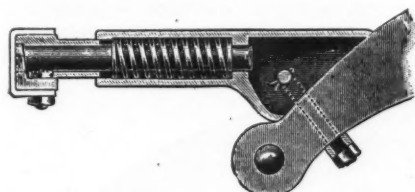
The Motor Car Socket Wrench set marketed by the C. M. B. Wrench Co., Darwood, N. J., combines the wrench and socket feature with the additional advantage of a removable handle. The handle is attached to the wrench head by a ball and socket joint so that it may be made to move up or down to clear any obstacles in the way of its swing in removing nuts or bolts. Many out of the way places can be reached with comparative ease because of this feature. Five different sets



Peoria Specialty Co.'s starter for Fords



C. M. B. removable handle socket wrenches



Cross section of bracket of Adeco bumper

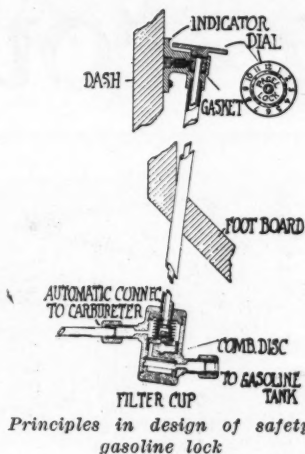
are offered ranging in price from \$4 to \$9. A feature of the line is the special Ford set which weighs 5 pounds and includes ratchet wrench extension, universal joint and ten sockets ranging in size from $\frac{1}{4}$ to $\frac{5}{8}$ inch square and hexagonal. The price complete in a carrying case is \$4. Other sets are listed at \$4, \$6 and \$6.50. The equipment DeLuxe known as the Silver King, including adjustable handle ratchet wrench, screw driver, spark plug socket and 16 square, hexagonal and cap screw sockets, ranging in size from $\frac{1}{4}$ to $\frac{5}{8}$ inch, sells at \$9.

Channel Steel Bumpers

Adeco bumpers manufactured by the Auto Device Mfg. Co., Milwaukee, Wis., are equipped with smooth one-piece brackets of simple, graceful lines and without unnecessary and unsightly projections and lugs. They are said to be strong enough to withstand the hardest bumps with perfect protection to the tire. The curves of the bracket have been so worked out that the Adeco will fit 90 percent of the cars on the market and stand out on a straight horizontal position without the use of wedges or shields. The coil compression spring works on a plunger rod in the bracket which has an action of $1\frac{1}{2}$ inches. The cross bar is made of hard cold-rolled steel, highly polished, heavily coppered and nickel plated to protect them against rust. The prices range from \$5 to \$9, depending on the weight of the cross bar and whether it is a channel, round or diamond bar.

Combination Gasoline Lock

In the minds of the engineers of the Turner Brass Works, Sycamore, Ill., the increasing number of automobile thefts has created an unprecedented demand for a safety auto lock and they have accordingly introduced the Pagel combination gasoline lock. The device is operated from the dash or cowl board and consists of three disks revolving in a chamber and engage with each other in the same man-



Principles in design of safety gasoline lock

ner as the disks of a combination lock. Each disk is pierced by a hole. When the lock is open the holes of all three disks are in alignment and the gasoline flows through unobstructed. The disks are controlled by the numbered dials, but a single turn on the dial throws these holes in the disk out of alignment and positively locks the flow of gasoline. A great variety of numbers may be used, making combinations of either two or three figures, and the owner can set his lock to any desired combination in case of discharging a chauffeur. The combination lock may be opened in the dark by feeling the notches. Inside the device is a strainer and filter cup which prevents dirt from clogging the needle valve seat. The cup also serves in removing water from the gasoline and the impure grease may be periodically removed by unscrewing the cap at the bottom. The price is \$3.50 for cars with cowl boards and \$3 for straight dash board equipment.

Four Wheel Brakes

According to the Morton Brake Co., Minneapolis, Minn., skidding can be minimized and practically eliminated by the use of front wheel brakes. After a great deal of experiment, the company has perfected a braking system which is applicable to any standard design of front axle. The application of this equipment is said to not only reduce skidding but to relieve the rear drive wheels of enough work to afford a great saving in tires. An equalizer is fitted which insures an application of both brakes at a pressure of the foot pedal under any condition. The braking surfaces are wide and of large diameter, affording positive and smooth action.

Khaki Overall Suits

Now that summer is here motorists who work around their own cars look for the coolest overall garment they can get that will thoroughly protect them. Protexall duster suits and overall suits made by the Protexall Co., Arlington, Ill., are designed for just this purpose. The Protexall duster slipped on over your regular clothes is a sure protection against dirt, dust and

mud. It can be easily washed and is durable enough to stand many washings. The duster has a combination loose and tightfitting roll collar, wide two-button adjustable cuffs, button side slits giving easy access to all pockets, comfortable raglan sleeves and the skirt can be buttoned together to serve as trouser legs. Both the duster and overall suits are made of high grade olive khaki cloth.

Brugan Economy Valve

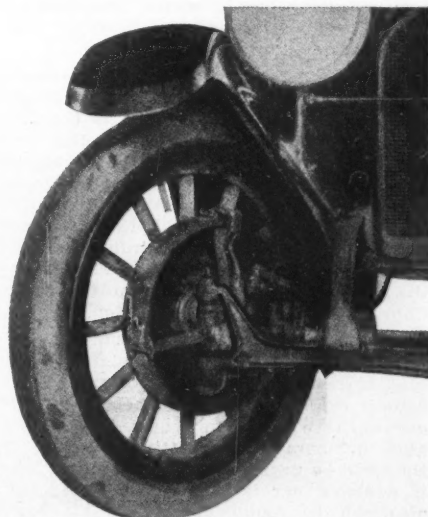
Auxiliary air is automatically supplied to the manifold by the Brugan economy valve. The valve casing is screwed into the intake pipe and houses a valve which is closed by a spring. At low speeds the valve remains closed, but as suction increases the valve opens and air enters through the small ports in the end of the valve housing. There is an adjustment in the end which varies the tension on the spring. Economy and increased power are the claims made for this device and if not satisfactory it may be returned within 30 days and money refunded. It is the product of the Brugan Co., Bangor, Me., and sells for \$4.

Quick Action Auto Lock

The L-G Auto Lock is designed for cars having central control with a ball and socket type of shifting lever. It is marketed by the Howard Automobile Co., San Francisco, Cal. The lever is locked in neutral position by a hinged ring which passes around the base of the lever. The ring is fastened by a padlock. It may be instantly applied to any car with this type of lever, it is said. Three dollars is the price.

Liquid Body Polish

No Rub body polish is a liquid polish which will increase the brilliancy of the body surface but will not restore the finish once it has been destroyed by abuse, wear or neglect. The S-O-S Mfg. Co., 167 S. Stevens St., Spokane, Wash., is the maker. It is applied with cheese cloth and after drying the body should be rubbed with a dry cloth. This is all that is necessary to restore the finish.



Morton front wheel brake

From the Four Winds



MUNITIONS FOR DEFENSE OF VERDUN—Shipping munitions from one of the supply depots to the front at Verdun. Although the heavy artillery eats up the supply quickly there always seems to be more on hand to turn the enemy back.

KANSAS Tags Black and White—The new license tags of Kansas are black and white numerals instead of the yellow and black tags that adorned the cars last year. New tags will be issued beginning July 1.

Ohio Awards Road Contracts—The Ohio Highway Commission has awarded contracts for road improvements in twenty-six counties in the Buckeye State totaling 92 miles at a cost of \$1,367,000. This is the third letting of contracts by the Ohio highway department during the present season. When the work is completed Ohio will have improved 267 miles of roadway during the present year.

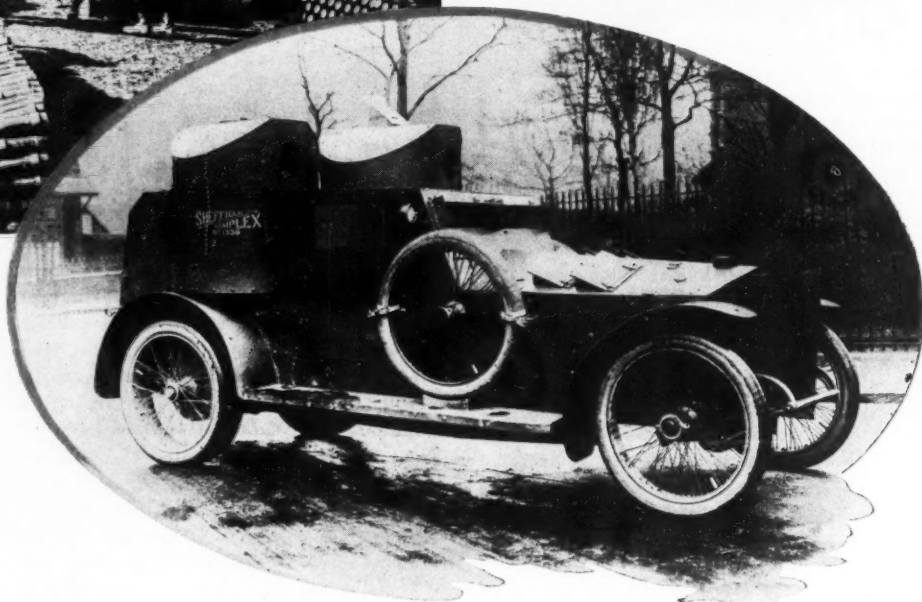
Motor Fare vs. Railroad Ticket—Motor stages are giving the railroads a lively competition in various parts of the country. Between San Diego and Los Angeles, for example, the single railroad fare is \$3.85 while by motor the fare is only \$2.50. The return fares are \$5 and \$4.50 respectively, in favor of the motor bus. Besides saving money in traveling by motor, the passengers have the advantage of the fresh air and a better chance to see the country.

Club Campaign Against Glass Throwers—A campaign against the throwing of glass and other sharp substances on to the street has been started by the Chillicothe Motor Club, Chillicothe, O. At a meeting recently the question of offering rewards for reports of violations of the law against this practice was discussed. A law prohibiting the throwing of substances liable to injure tires was one of the bills passed at the last session of the legislature after introduction through the Ohio State Automobile Association.

Kansas to Record Engine Numbers—J. T. Botkin, Kansas secretary of state, is planning to install a card index of engine numbers of cars registered for license. Hitherto owners have not been required to give engine numbers when getting licenses, but they will be urged to do so hereafter. Then, if a stolen car is found, the owner for it also can be found quickly, if his car is registered in Kansas. This plan is in harmony with the spreading effort of police

come covered with mud. He has had several fined and says that he will not let up in the crusade.

Canadian Car Statistics—Out of 8,616 licensed cars in Manitoba, for the year 1915, 3,425 were Fords, 1,004 were McLaughlins, and 622 Overlands. These three makes were leading sellers. In Saskatchewan, where there is about the same number of licensed cars as in Manitoba, there are 3,514 Fords, 742 McLaughlins and 304 Overlands. In Alberta 5,586 cars bear license plates. Of



ARMORED MOTOR CARS BEING USED BY THE ALLIES—The armored English Sheffield Simplex car with USL starter are now in active service. The Allies have many of these machines in the fields "somewhere in France." Note the opening in the turret for a gun. Armored cars are the main mode of travel on the battlefield. The cars have proved so useful that the U. S. Government has intentions of having cars of a similar design built for the army.

and other agencies to promote attention to engine numbers as the only sure means of identifying cars.

Motorists Must Keep Tags Clean—E. Austin Baughman, who recently took office as Maryland's motor vehicle commissioner, is conducting a strenuous campaign against motorists who permit their license tags to be-

this number there are 2,695 Fords, 583 McLaughlins and 312 Overlands. These cars were the "best sellers" during previous years as sales and license figures show. This year, competition is keener. The new and comparatively new machines are battling for sales supremacy. The Chevrolet, Gary-Dort, Hudson Super-six, Scripps-Booth and other late editions to the market are establishing sales records every day.

Horses Scarce; Shoeing Rates Raised—Because the motor car has reduced the number of light harness horses to a minimum, leaving only the heavy draft class to be shod, the Milwaukee County Horseshoers' Association, Milwaukee, Wis., on June 1, placed in effect a general advance in prices for new shoes, resetting, and leather pads. The heavy horses require a much heavier and more expensive shoe than light animals, and in addition the cost of materials has risen considerably.

Favors Examination for License—Judge George E. Page, of the Milwaukee police court, stated in open court a day or two ago that legislation compelling motorists to take an examination before they are granted a license should be passed because of the enormous increase in the number of motor cars. "There are many people driving cars today who could not obtain a license if they had to pass an examination."

Coming Motor Events

CONVENTIONS

June 12-16—S. A. E. annual cruise, Lake Huron and Georgian Bay

TRACTOR DEMONSTRATIONS

July 17-21—Dallas Tex.
July 24-28—Hutchinson, Kan.
July 31-Aug. 4—St. Louis, Mo.
Aug. 7-11—Fremont, Neb.
Aug. 14-18—Cedar Rapids, Ia.
Aug. 21-25—Bloomington, Ill.
Aug. 28-Sept. 1—Indianapolis, Ind.
Sept. 4-8—Madison, Wis.

Among the Makers and Dealers



Motor truck train arriving at Headquarters camp near Namiquipa, Mexico. The camps and depots in Mexico depend for supplies, ammunition, and food upon these trucks which make their regular trips from the border to the various camps which mark the progress of the American forces in Mexico

VANDERBECK to Leave Timken—H. Vanderbeck, chief engineer of the Timken Roller Bearing Co., Canton, O., will sever his connection with that company in the near future. His successor has not yet been selected.

Splitdorf Gives Wage Bonus—The Splitdorf Electrical Co. has announced a 10 per cent monthly bonus to all employees to take effect at once. Over 1,600 employees will be affected by the increase, which will amount to about \$150,000 a year.

MacMullen in Chalmers Sales—B. J. MacMullen, well known as a motor car sales executive, having formerly been connected with the Willys-Overland Co. as factory and special representative, has been appointed as assistant sales manager of the Chalmers Motor Co.

Lambright to Join Marion Tire—Grant Lambright, superintendent of the Bucyrus Rubber Co., Bucyrus, O., will leave that company on July 1, and will join the Marion Rubber Co., Marion, Ohio, in a like capacity. His successor, it is understood, will be John Field, now assistant superintendent.

Oakes Company Adding—The Oakes Co., Indianapolis, Ind., manufacturer of parts, accessories and metal stampings, is preparing to erect a modern, fire-proof building alongside its present plant. This new building will be especially designed for the class of manufacture in which the concern is engaged and will give it about one-half more floor space than it has at the present time.

Ilse Resigns from Jiffy—Frank H. Ilse, inventor of the well-known quick-acting curtain for motor cars and president of the Jiffy Curtain Co., Detroit, Mich., licensor of patent rights under Ilse's patents, has disposed of his interest in the concern to R. C. Manson, also connected with the company, and has

retired as president. Mr. Manson becomes president and treasurer. A new administration building is included in the plans, which will require about 2 years to carry out.

Skinner Joins Liberty—G. S. Skinner has joined the sales division of the Liberty Motor Car Co., Detroit, Mich. Skinner has been connected, during the last few years, with the Canadian distributors of the Hudson company.

Hilts with Puritan Machinery—M. R. Hilts, formerly connected with the advertising department of the Oakland Motor Car Co., and of the Paige-Detroit Motor Car Co., has been appointed assistant advertising manager of the Puritan Machine Co.

Goodyear Plant in Toronto—The Goodyear Tire & Rubber Co., Ltd., is building a plant at Toronto, Ont., to be exclusively for the manufacture of pneumatic tires. The amount invested, which includes equipment cost is between \$1,250,000 and \$1,500,000.

White Orders Gain 45 Per Cent—Domestic orders of the White Motor Co., Cleveland, O., have gained 45 per cent during the first 4 months of 1916. It is reported that 4,000 White trucks are being used by the Russian army and that further orders from that country are expected. At the French army's headquarters, 1,000 White trucks are held for emergency service, so that not less than 5,000 White trucks are in use by the Allied army.

Parts Maker Opens Plant—To accommodate the rush of business from the motor car industry, the Western Malleables Co., Beaver Dam, Wis., has resumed operations in the big South Street foundry, which has been idle for 2 years. The company took over the properties of the Beaver Dam Malleable Iron Co., bankrupt, in 1914 and has been operating two of the three works at a 24-

hour capacity for several months. The main product formerly was railroad castings, but this business now is overshadowed by the production of motor and car parts. From 250 to 300 men have been added to the payroll to operate the South works.

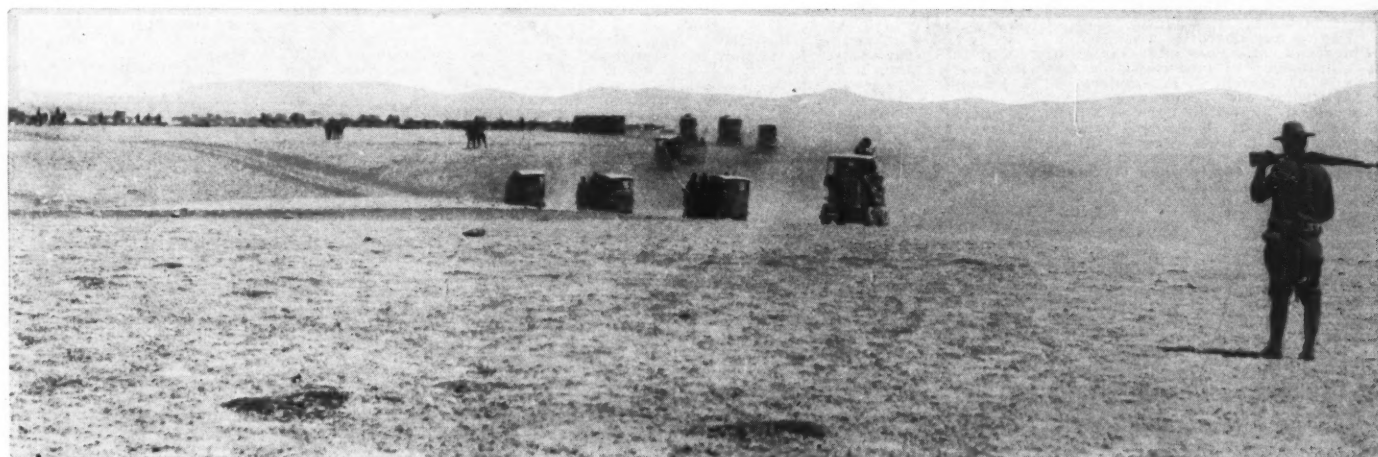
Anderson Joins Locomobile—W. H. Anderson, for several years agent in St. Louis, Mo., for the Kelly-Springfield trucks, has joined the local Locomobile Company, to take charge of the sales of Ricker trucks.

Reynolds with Paige—E. H. Reynolds, Jr., has joined the Paige-Detroit Motor Car Co., Detroit, Mich., in the capacity of special representative. Reynolds comes from the Champion Ignition Co., Flint, Mich.

Want Houk in Philadelphia—The industrial bureau of the Philadelphia Chamber of Commerce is negotiating with the Houk Wire Wheel Co., Buffalo, and a group of New York and Detroit capitalists with a view to having it establish a plant in Philadelphia.

To Make Farm Tractor—A company is in process of formation among the business men of Hoopston, Ill., to manufacture the Porter form tractor. A demonstration by the inventor, given upon various forms of the vicinity, convinced the investors that it was a good thing and the necessary stock has been subscribed. In a short time, steps will be taken to incorporate and secure the requisite building and machinery.

Moto-Meter Moves to New Plant—With standard equipment on forty makes of cars and with business increasing each day, the Motometer Co., New York, maker of the Boyce Moto-Meter, has been forced to find larger factory quarters. A large three-story plant in the center of the motor district in Long Island City has been taken and manufacturing will be started in it about July 1. The new plant will put the company on a larger scale of production, about triple the



Jeffery quads with troops and rations bound for San Antonio, Mexican Base. The photograph was taken near Namiquipa, Mexico

present, and the floorspace will be increased five times the present, about 20,000 square feet. The local plant will not be given up, operations in it being confined to light assembly work.

Battery Expert to St. Louis—Ben Edwards, battery expert of the Willard plant, has arrived in St. Louis to take charge of the service department of the Battery Service Company, which handles the Willard line.

F. C. Goodenow With Miller Company—F. C. Goodenow of Los Angeles, California, is now associated with E. S. Harlan, president of the Miller Carburetor Sales Corporation, as general manager of the Chicago branch at 2526 Michigan avenue.

Arizona Moon Dealers—J. W. Angle of Wilcox, Ariz., has been appointed an agent for the Moon cars. He answered an advertisement, agreed upon terms by mail and ordered five cars shipped without having seen the cars or the factory.

Moon Has New Finishing Plant—The Moon Motor Car Company announces the opening of an air system for finishing their cars. R. L. Cleveland, superintendent of the finishing plant, says that in addition to other advantages, the plant will give the needed increased capacity.

Allen Breaks Ground for Addition—The Allen Motor Company, manufacturers of moderate priced motor cars, has broken ground for an addition to their motor and transmission plant at Bucyrus, Ohio. The addition to be erected will double the size of their present plant and will assure their making prompt shipments to all Allen dealers.

Wagner Electric Buys at St. Louis—The Wagner Electric Company has bought the factory end of the Carter Carburetor Company, St. Louis, Mo. The Carter company will retain the marketing end of the business, which for 2 years has been handled by the H. W. Johns-Manville Company. The change in ownership of the factory is expected to result in a greatly increased output.

Milwaukee Stamping Company Builds—The Milwaukee Stamping Company, Sixty-fourth and Pullen avenues, West Allis, Milwaukee, is about to award contracts for a large factory addition, to cost between \$18,000 and \$20,000. Plans have been prepared for a reinforced concrete and brick structure, 72x122 feet. The company does a large business with motor car manufacturers and also

makes a general line of hardware specialties in sheet metal. The capacity has been crowded for a long time.

Wilmington Motor Parade—The motor car played a conspicuous part in a "preparedness parade" which was held in Wilmington, Del., last Saturday, when there was a motor division more than a mile long, in charge of J. M. Nixon. It was decidedly creditable.

Pantasote Gets Chalmers Contract—The Pantasote Company has closed a large order for top material with the Chalmers Motor Company, and their product Pantasote will be standard top material on the new Chalmers Model seven-22.

Blair Out of S. K. F.—F. R. Blair, formerly secretary, treasurer and sales manager of the S. K. F. Ball Bearing Company, has resigned and has become president of the F. R. Blair & Co., Inc., with offices at 50 Church street, New York City. It is understood that Mr. Blair is engaged in developing motor efficiency devices.

Washington Dealers Visit Moon—Messrs. Anison and Proby of the Anison-Proby Motor Car Company of Washington, D. C., reached the Moon factory last week on their tour of western factories to select a car for their sales department. After visiting the Moon factory and riding through the hilly parks in a Six-30 and Six-44, they ordered 100 cars and terminated their trip. They came here from Detroit.

Bell Motor Car Company Recapitalizes—The Bell Motor Car Company which was organized in York, Pa., less than a year ago, for the purpose of manufacturing automobiles, has increased its capitalization to \$1,000,000. They have just purchased a 15-acre factory site in East York at Rockburn Station, upon which they propose to erect, between now and the first of the year, modern factory buildings.

New Oakland Distributor—E. A. Hatfield, for five years assistant secretary and director of sales of the Bain Wagon Company, Kenosha, Wis., has tendered his resignation, effective July 1, to become the leading spirit in the organization of the Mississippi Valley Motor Car Company, with headquarters in St. Louis. The company will act as distributor of Oakland cars in the Mississippi valley, the territory including the states of Louisiana, Mississippi, Arkansas, southern Illinois, eastern Missouri, western Kentucky,

Tennessee and some other tributary territory. Associated with Mr. Hatfield in the project is F. W. A. Vesper, St. Louis, who has been Buick distributor in St. Louis and vicinity for some time.

New Era to Build Plant—The New Era Engineering Company, Joliet, Ill., has purchased a site and is building a new factory.

Beardsley Overland Buffalo Manager—N. A. Beardsley has been appointed manager of the Buffalo, N. Y., Overland branch. He formerly was a representative of the Willys-Overland Company.

Cadillac Dealer Changes—G. H. Geiger, formerly manager of the South Bend, Ind., Cadillac agency, has been appointed general manager of the Cadillac Automobile Co. for Indiana, with headquarters at Indianapolis.

Bour-Davis Buys Plant—The Bour-Davis Motor Car Company, Detroit, Mich., has bought a new plant at West Fort and Twenty-third streets. This will be occupied while another is under construction on Kercheval avenue.

New Cleveland Willard Manager—Charles H. Frizell has been appointed manager of the service station at Chester avenue and East Twenty-third street, Cleveland, O., for the Willard Storage Battery Co. He was formerly manager of the Omaha territory for this company.

Lee Tire Men to Share Profits—The Lee Tire and Rubber Company, Conshohocken, Pa., has adopted a profit sharing plan. Under this, certain of the older employees will receive a percentage of the net earnings over and above \$300,000 required for the payment of the present regular dividend of 50 cents per share quarterly, plus 25 cents extra. Each employee on the selected list will receive a bonus from the surplus earnings in proportion to his salary.

St. Louis Republic Station—The Republic Motor Truck Company of Missouri is being organized with W. L. Murphy, B. W. Hilgard and L. E. Fischer as incorporators. The company will conduct a sales room and service station for the Republic trucks at Sixteenth and Chestnut streets, St. Louis. The details of the incorporation will be announced later. The Republic is the last of the well known trucks to gain adequate representation in this city.

Ashland, O.—Eagle Rubber Co.; capital stock, \$50,000; incorporators, Harry R. Gill and others.

Cleveland, O.—Ohio Service Motor Co.; capital stock, \$5,000; incorporators, LeRoy J. Linn, Roy F. Allan, Fred W. Marcolin, H. L. Davis, B. B. Russell.

Cleveland, O.—Sixth City Gasoline Co.; capital stock, \$10,000; to deal in gasoline and oils; incorporators, Joseph Wilder, Harry Siegel, Paul W. Stanley, G. Z. Weintraub and E. W. Breyer.

Columbus, O.—C. A. S. Products Co.; capital stock, \$100,000; to manufacture and sell parts and accessories; incorporators, Charles D. Cutting, Charles S. M. Krumm, J. W. Graham, A. W. Taylor and Dorothy Leechler.

Cleveland, O.—Parkside Garage Co.; Capital stock, \$10,000; to operate a garage; incorporators, A. C. Marsh, C. P. Sanders, R. H. Bosley, W. J. Bishop and Thomas F. Hallock.

Cleveland, O.—Ohio Service Motor Co.; capital stock, \$5,000; to operate garage and repair shop; LeRoy J. Linn, Roy F. Allan, Frederick W. Marcolin, H. L. Davis and B. B. Russell.

Cleveland, O.—Lakewood Garage Co.; capital stock, \$25,000.

Cleveland, O.—Westgard Tire & Rubber Co.; capital stock, \$10,000.

Cleveland, O.—Wright Tire & Rubber Co.; capital stock, \$100,000.

Concord, Mass.—Burrill Tire Tool Co.; to manufacture a device for removing rims from motor car tires; capital stock, \$100,000.

Cleveland, O.—Harris Carburetor Co.; capital stock, \$10,000; to manufacture carburetors; incorporators, G. Gobeille, Frank G. Mooney, W. W. Burk and Norton McGriffith.

Chicago, Ill.—Olympian Motors Co.; to buy and sell motor vehicles; capital stock, \$1,000,000; incorporators, G. C. Bull, C. E. Callender, F. Arnd.

Cleveland, O.—American Auto Sheet Metal Co.; capital stock, \$25,000; to manufacture sheet metal for motor cars; incorporators, W. J. Mahon, D. Gobeille, W. W. Burk, W. J. Monaghan and Norton McGriffith.

Recent Incorporations

Chicago, Ill.—North Ave. Motor Sales Co.; capital stock, \$1,000; incorporators, David Gordon, J. R. Roberts, Anna Roberts, F. R. Gordon.

Cleveland, O.—Logan-Fischer Motor Co.; capital stock, \$50,000; to deal in motor cars and supplies; incorporators, C. M. Logan, Cark H. F. Fischer, George L. Drake, M. M. McLaughlin and R. J. Lamb.

Dover, O.—Tuscarawas County Automobile & Aeroplane Co.; capital stock, \$3,000; incorporators, W. H. Scheu, R. C. Shaw, R. E. Herzig, F. D. Johns and L. H. Scott.

Decatur, Ill.—Cadillac Co.; capital stock, \$8,000; incorporators, Rollen Travis, A. C. Field and R. L. Noel.

Dallas, Tex.—Cactus Motor Company; capital stock, \$15,000; incorporators, E. E. Wiseman, Chas. Thomas and R. L. Nichols.

El Paso, Tex.—Aztec Auto and Battery Co.; capital stock, \$200; incorporators, W. H. and E. H. Fletcher and R. J. Channell.

El Paso, Tex.—Borderland Auto Supply Co.; capital stock, \$10,000; incorporators, D. L. Clements, Homer B. Lynne and J. M. Howard.

St. Worth, Tex.—Worth-Moore Motor Sales Co.; capital stock, \$5,000; incorporators, W. C. Stonestreet, J. F. Sanderlin and John H. Matthews.

Fort Worth, Tex.—Beck Automobile Co.; capital stock, \$5,000; incorporators, W. C. Stripling, W. H. Beck and J. C. Griffith.

Indianapolis, Ind.—Mitchell Auto Co.; motor cars and accessories, capital stock \$5,000; incorporators, W. M. Wilkes, H. T. Wilkes, C. C. Himes.

Kankakee, Ill.—Kankakee Automobile Co.; capital stock, \$50,000; incorporators, H. L. Mann, A. S. Mann and Fred Mann.

Lexington, Ill.—Lexington Garage Co.; capital stock, \$15,000; to deal in motor cars, accessories, and to do a general repair business; incorporators, J. W. Ashbrand, H. E. Payne, C. A. Ashebrand, N. E. Franklin, I. D. Adams and C. L. Ashebrand.

Ottawa, Can.—F. S. Carr Rubber Co.; capital stock, \$200,000; to manufacture rubber, motor cars fabrics; incorporators, J. E. Day, J. M. Ferguson and J. P. Walsh.

St. Paul, Minn.—White Auto Supply Co.; capital stock, \$25,000; incorporators, J. T. White, H. L. White and M. N. Chrissinger.

St. Paul, Minn.—American Motorists' Association; to furnish protection for the traveling motorist in dealing with hotels, garages and supply stores; capital stock, \$2,500,000; incorporators, W. D. Bell, A. D. Smith, F. D. Peabody, F. T. Persinger, J. A. Walker.

Springfield, Mass.—Arrow Co.; capital stock, \$25,000; incorporators, I. H. Page, C. R. Culver, G. A. MacDonald.

Toronto, Ont.—Globe Shock-Absorbing Tire Co.; to manufacture a resilient tire; capital stock, \$1,000,000; incorporators, Isaac Normandy and Howard J. Ecclestone.

Toledo, O.—Wolverine Automobile Company; capital stock, \$175,000; to manufacture and sell motor cars and parts; incorporators, Albert H. Collins, Eli W. K. Burg, Benj. T. Batsch, Norman W. Reed and Edward W. Kelsey, Jr.

Toronto, Ont.—Maple Leaf Tires, Ltd.; capital stock, \$500,000.

Worcester, Mass.—Morgan & Corey; motor cars; capital stock, \$10,000; incorporators, R. L. Corey, H. G. Rogers.

Waltham, Mass.—West End Garage Co.; capital stock, \$20,000; incorporators, W. J. Parry, H. E. Tuttle.